THE AMERICAN GAS LIGHT JOURNAL
INC.

PUBLISHED WEEKLY, AT 42 PINE ST.

VOLUME CIII. No. 24.
Whole No. 3,014.

NEW YORK, MONDAY, DECEMBER 13, 1915.

Subscription, $3 Per Year.
$4 Canada, $5 Foreign.

LIBRARY OF CONGRESS,
DEC 13 1915
SMITHSONIAN DEPOSIT.

Riter-Conley Manufacturing Company

STEEL CONSTRUCTION

Pittsburgh

INDEX TO CONTENTS, PAGE 384.

ADVERTISERS' INDEX, PAGE 24.

KOPPERS

BY-PRODUCT COKE AND GAS OVENS

The most efficient method of carbonizing coal is in KOPPERS OVENS and the best coke and by-products are produced by this process.

H. KOPPERS COMPANY
Pittsburgh, Pa.

Builders of

By-Product Coke and Gas Plants
Tar Distilling Plants
Ammonia Recovery Plants
Benzol Recovery Plants

THE AMERICAN GAS LIGHT JOURNAL INC.

VOL. CIII., No. 24. NEW YORK, DECEMBER 13, 1915. WHOLE No. 2,134.

PRESIDENT McLEAN'S ADDRESS TO THE NATIONAL COMMERCIAL GAS ASSOCIATION.

One of the Constitutional requirements of this Association is that: "At each Annual Meeting the President shall present an address." I therefore propose giving to you very briefly a summary of the work that has been undertaken by your officers, directors and various committees, the details of which will be set forth in the reports read later; also a few recommendations for the consideration of the succeeding administration.

Directors' Meetings.—Your Board of Directors has held meetings monthly, except in August. The attendance at all the meetings has been unusually large, and great credit is due the members for their untiring interest and care in carrying on the affairs of your Association. As members of the Board live beyond commuting distance from New York, meetings were held in Washington, Chicago and Toronto, and I recommend to the incoming Board a continuance of this policy.

Membership.—The membership of the Association has remained practically stationary during the year. The addition of new members has been fully up to the standard of other years, but we have lost a number through resignation because of other business affiliations; some memberships have been cancelled by companies, and others (about one-third of the loss) were dropped for non-payment of dues. Therefore, while the growth has not been large, it has been a strong and healthy one.

While the increase in the number of company sections has been disappointing, it is through no lack of effort on the part of the committee, but largely on account of existing conditions and want of enthusiasm among those members who could be of material help in this direction. However, the conscientious work of the committee has laid a strong foundation upon which to build in the future, and I recommend that strenuous efforts be made next year to encourage the formation of new sections and strengthen existing ones; from this, much good can result, to both the individuals and the Association.

Educational Work.—The educational work continues to hold the foremost place in our activities. The early part of this year saw the completion of last year's course on the "Utilization of Gas Appliances." More than 1,000 students received diplomas. The interest shown in the new three-year course—now well under way—is most encouraging, the enrollments at this time being over 1,500.

The Board of Educational Control may well be proud of its efforts. They are preparing a splendid course, and I cannot help but feel that if every gas company manager, who realizes the necessity for properly trained employees, was familiar with this work, he would avail himself of this opportunity for developing his men. There is on display in the Registration Room a complete exhibit, showing details of the various courses included in this undertaking; and I commend it to the attention of everyone here.

GAS LIGHTING NEEDS NO OBITUARY

—H. B. McLEAN.

Campaigns.—Two special campaigns, "Gas Range Week" and "Gas Lighting Week," which were prompted and supported by your Association, were productive of the most satisfactory results. These special campaigns, I think, should be repeated annually, and at least one more—"Gas Heating Week"—added.

The enthuiasm shown in the recent competitions for the best window display during "Gas Lighting Week" was an encouraging indication that gas companies are at least beginning to realize that they have long neglected this most important and valuable means of stimulating public interest. The window display service planned for next year should prove of great value to all gas companies, and no doubt will be liberally supported.

Monthly Bulletin.—While the Monthly Bulletin has served to keep the members informed of the undertakings of the Association, I believe that its usefulness would be enhanced if the members at large, and particularly the Chairmen of Committees, would take a more active part in the preparation of articles for publication, and I hope the incoming Board will strongly urge this.

Industrial Fuel Expert.—Following the suggestion made by my predecessor in his address a year ago, your Board has authorized the employment of an Industrial Fuel Expert. A committee is now canvasing the field for a competent man, and it is hoped that within a very short time we will have such a man available for service with companies who desire help in solving some of their industrial problems.

Promotive Lecture Bureau.—I strongly recommend for the careful consideration of the incoming Board, the desirability of establishing a Promotive Lecture Bureau, its object to be the presentation of trade lectures covering the specialized applications of gas for industrial uses; the bureau to be at the service of company members who may desire to give instructive and entertaining talks to various trade organizations. I believe that for this Association to undertake such a broad, progressive movement, would enhance its usefulness, and more firmly establish its position as being of practical help to the gas industry.

Devolopment of Industrial Fuel.—The work of the Industrial Fuel Committee is deserving of particular attention. They have completed and published a number of pamphlets on the use of gas for various industrial purposes. These are well worthy of a broad distribution, and I hope everyone interested in the industrial uses of gas will avail himself of the opportunity to obtain copies of these books.

Co-operation With Other Associations.—The attitude of your administration toward other Associations, during the past year, has been one of co-operation. We have had no less than five joint committees with the American Gas Institute, working on subjects which come within the province of both. Much good has come of this policy, and I recommend it be continued, and extended to

other Associations. If the lines of activities of two or more associations overlap, the best results will be obtained, and the strongest influence exerted, where such overlapping questions are considered by a joint committee. There is ample room in the gas industry for all associations—each to do effective work in its own lines, but I think you will agree that when all associations get together on a broad basis, and each unit helps instead of criticizing the others, better results will accrue to the industry at large.

Progress in Gas Lighting.—One of the first uses for gas was as an illuminating agent, and its first great development and progress was along this line. Other uses were discovered, and grew so rapidly that for a time they overshadowed the illuminating branch of the industry. Inroads were made by other illuminating agents, until it was realized that gas illumination would not survive unless given more serious attention. An active and aggressive interest was centered on this problem, and it was not long before gas lighting received an impetus which placed it again in the front rank.

This seems a fitting time in which to firmly convince our competitors, and the public, that gas illumination needs no obituary; it has slept perhaps, but it is now awake, refreshed and vigorous, and quite able successfully to withstand all assaults.

Salesmens' Handbook.—One of the promises made by the present administration was the preparation, and presentation at this meeting, of a Salesmens' Handbook, and I am glad to say that this promise has been fulfilled. The Committee having this work in hand has labored unceasingly, and while they make no claim to having prepared a complete book, they present one for which there is much need, and which should be in the hands of every manager and salesmen in the gas business. It is necessary that this work be continued by the new Board, and new sections added as rapidly as they can be prepared.

Mid-Year Conference.—The second Mid-Year Conference was held in the Auditorium of the Consolidated Gas Companies' Building in New York, on June 10th and 11th. Prior to the conference the various committees held meetings for the purpose of planning their work for the balance of the year. These meetings were all well attended. There were three general sessions held, at which the average attendance was considerably over 250. These Mid-Year Conferences have proved a great help in administering the affairs of the Association.

Advisory Committee to the President—One of the most important undertakings of the year has been the work of the Advisory Committee to the President. Its hearty support and cordial co-operation has been invaluable, and I strongly recommend to the incoming Board careful consideration of the report of this committee, and a continuance of its valuable work.

Exhibitions.—The exhibition of gas appliances in the adjoining room has been directed by the Manufacturers' Section, and certainly great credit is due them for this splendid display. This exhibition is, by intention, on a smaller scale than heretofore, but there has been no lack in interest, or in the demand for space by manufacturers to show their wares. I commend this exhibit to your serious consideration; and the succeeding sessions have been so arranged as to give ample time for a careful study of all the appliances shown.

Papers.—The papers and reports that will be presented combine to make a most excellent program, which demands your earnest attention and participation. The speakers who will address you are gentlemen of national reputation, and no word from me should be necessary to insure a full attendance at all sessions.

Conclusion.—I wish to express to the officers, directors, committeemen and members my thanks and appreciation for their helpful support and hearty co-operation during the past year. I also wish to thank the office staff for their faithful and efficient services, and the trade journals for their aid in advancing the interests of the Association.

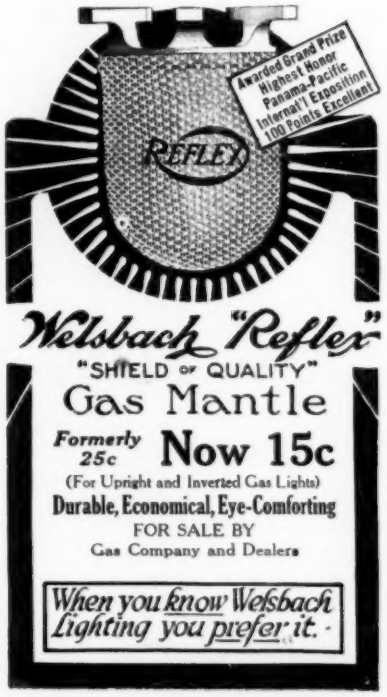
Newspaper Advertising.

What to say, how much space to take, getting an attractive cut, and the time to do it—all of these things in newspaper advertising are solved as far as Welsbach Co.'s mantles are concerned, by their electrotype service. They have made up a dozen ads. of various sizes and shapes, three small ones of which we reproduce here.

This method of making advertising easy is an expensive one for the manufacturer, and Gas Companies should take advantage of it.

These particular ads. were prepared by a representative advertising house and will do credit to the gas business. Advertisements, prepared and electrotyped and ready for use, are available for Gas Companies by the thousands, and if any gas company needs an ad. that will make sales on any appliance, write to the JOURNAL and we will see that your wants are filled.

REFLEX
It Helps Your Eyes
to see with clearness and comfort; it brings beauty and cheer into your home; it puts money in your purse,—this wonderful
Welsbach "Reflex"
"SHIELD OF QUALITY"
Gas Mantle
Formerly 25c Now 15c
(For Upright and Inverted Gas Lights)
Awarded Grand Prize
Highest Honor
Panama-Pacific
International
Exposition
100 Points Excellent
FOR SALE BY
Gas Company and Dealers
When you know Welsbach lighting you prefer it

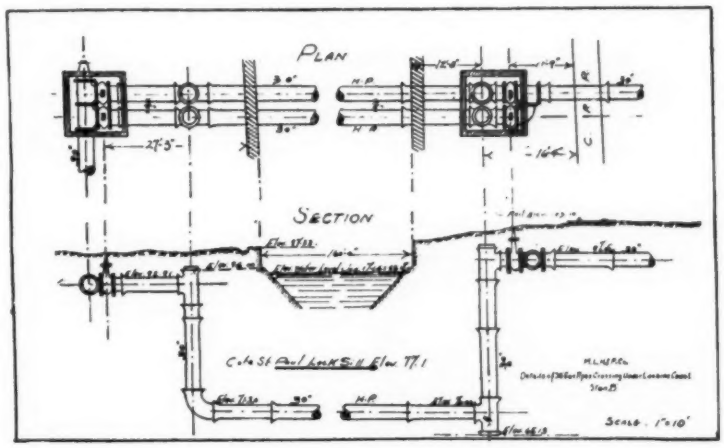


SOME DIFFICULT WORK IN LARGE GAS PIPE LAYING UNDER THE LACHINE CANAL AND ADJACENT SWAMPS.

By C. H. OSLER, to the Canadian Gas Association.

Some two years ago The Montreal Light, Heat & Power Company, operating the Montreal Gas Company, decided upon the necessity for an additional gas works plant at the south-western end of the city, the site selected being between the Lachine Canal and the City Water Work's Aqueduct. As this section at present is not much built up, and no large quantity of gas would be required for some time, it was necessary to convey the gas from these new works back to the center of the city; as well as provide for contemplated extensions in a northerly direction, west of the mountain and around and north of the same, and eventually complete one of our proposed high pressure belt lines around the mountain.

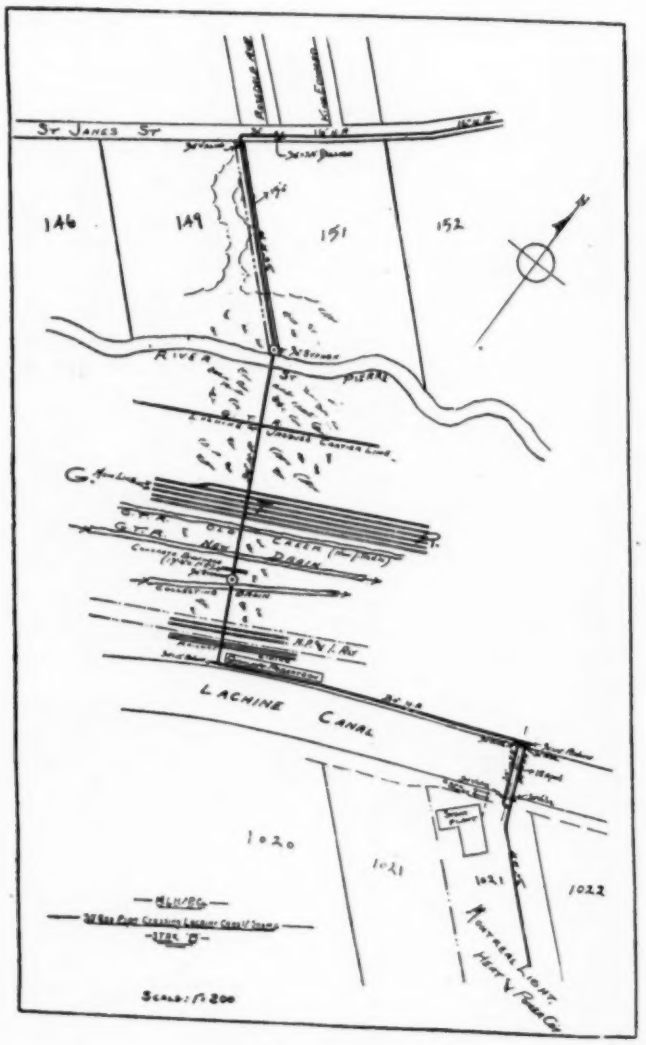
With this in view it was necessary to cross the Lachine Canal with our main outlet pipe, which it had been decided would be 30" from the 6,000,000 cubic foot gas holder and compressor house, situated half a mile from the canal bank. As the canal authorities suggested that the canal would probably be deepened at some future date, and as it was a practically all-rock bottom for a considerable distance on each side of our property, it was thought advisable to lay two mains coupled together, across the canal, so that in case of injury to one the other would be available.



Work was commenced a few days before the canal was unwatered; which is usually done from April 1st to May 1st each year, to allow any Government repairs to be made, and the numerous private lesees along the canal to get their various sluices and dams into shape for the coming season. This particular year, 1914, the Government having considerable new work to do, unwatered the canal on February 28th, and refilled it on April 15th, so that our work had to be completed within that time. As the winter had been unusually severe, we had considerable frost to encounter, and over $2\frac{1}{2}$ feet of solid ice had to be cut and removed on a strip about 50 feet wide across the canal, before the water was let out; as we should have been unable to easily remove it, had it settled on the bottom. In any case this ice was a very great drawback to the work, as all along the canal it lay on the sides and bottom, and dammed back the water so that we had from 4 to 7 feet to contend with. The ice did not disappear until our work was practically finished. We started work by sinking a $9\frac{1}{2}$ by 8 foot vertical shaft 12 feet back from the face of the sloping cement wall on each side of the canal, a few days before the water went out, at which time we were down to water level. We struck rock at about 15 feet on the side next the works, and blasting with dynamite was proceeded with. Timbering the shafts by sinking square frames of 6 by 8 lumber with 6 by 6 cross bar in center, and driving 2" plank vertically behind them as shaft was sunk, the shafts were carried down 30 feet on the north side, and 35 feet on the south or next the works side, so as to allow of the horizontal pipes being graded to the syphons formed by tees or single branches capped, on the bottom of the vertical pipes placed in the shaft 16" apart. Tunnels were then driven through the rock from these shafts out towards the canal bottom, and were met by tunnels driven from the open cut across the canal. The tunnels were timbered as the work proceeded, with bents of 8 by 10 timber, placed about 2 feet apart; the 3" roof planks being driven slightly ahead of the work where rock was not encountered. The excavating of the bottom of the canal was proceeded with at the same time, by means of a cofferdam of 30 feet wide extending half the distance across the canal, which was 160 feet wide, the cofferdam being composed of a double frame of 6 by 8 timbers connected with cross bar stiffeners every 6 feet, and vertical 2" rough double sheeting driven down on the faces. Our first real trouble occurred here, as the bottom being all rock had been shattered by submarine blasting done by Government contractors a few years previously in deeping operations. The charges had been put down deep, but as only the top had been dredged off, the loose shattered rock had gradually silted up again, making an extremely bad bottom on which to place cofferdams. Thirty or forty carloads of manure were required to fill and back these dams, as no clay was available, and it was thought that the manure would plug the crevices in the shattered bottom best. The sheeting was driven with a portable pneumatic hammer, furnished with compressed air from two 15-horse power compressors, placed in a shanty on the bank connecting to a 36" by 96" air receiver and pressure of 80 pounds maintained in it. This also served for four or five pneumatic plug drills, and four pneumatic caulking hammers. Of course, all these would not be operating simultaneously, so that we were never short of air. The excavation inside the dams was kept more or less dry by means of two 4", one 6", and one 8" centrifugal pumps operated by electric motors, the current for which was transformed from a 2,200 volt line following the canal. We had plenty of trouble with these pumps owing to the manure, which clogged them up every few minutes in spite of screens. At first we tried wrought iron suction pipes swinging lengthwise of the excavation, with a block and fall attached at the lower end so as to be able to hoist up the strainer end for cleaning out the chips and manure, etc., but this necessitated making a larger and longer sump hole than was necessary; and it may be stated here that too much time, trouble and expense cannot be incurred on the sump holes, which are always difficult to excavate, especially in rock and under water. Everything depends on getting a good sump hole. We had to abandon the wrought iron suction pipes and use flexible hose, on account of greater ease in handling, also no braces required cutting away as was always the case with the stiff pipe. Again the necessity for lengthening the suction as the excavation was put down deeper is done away with. Simultaneously with the excavation in the shafts, tunnels and long cofferdam, a shorter cofferdam was constructed on the north side extending out to within 30 feet of the other one, thus leaving an opening for the water which ran at the rate of about 2 miles an hour. A considerable gang was kept on this opening, sawing the ice out and steering the blocks coming down the canal safely through, and hauling it all out on to the solid ice below, and thence off to one side, where it was piled out of the way. If this work was neglected for an hour or two the channel would block below, and the ice ground and form a dam raising the water and, of course, flooding the work out. This would mean a suspension of operations until dams could be repaired, and all pumped out dry again. The work was proceeded with continuously, that is, a day and a night gang were employed with foremen over each gang, a gang on keeping clear, one or two excavating in river bed, one in each shaft or tunnel, a small gang of timbermen attending to the shoring, crib-building, etc., another gang keeping the cofferdam caulked up with manure, etc.; then special handy men following the pumps, motors, lighting, derricks, etc. A 10-ton derrick on top of the bank on each side, was so placed that it could hoist the buckets and drills from the shaft, swing section of crib into place, hoist blocks of ice, or swing scale boxes full of excavated rock from the bottom on to the bank, or lower pipe into place. One of the first operations, which should have been mentioned before, was the building of a good temporary bridge across the canal about 2 feet above the ice, parallel to and about 12 feet up stream from the line of the cofferdams. Along this was strung a hundred 16 and 32-candle power incandescent electric lamps. The bridge was wide enough for two wheelbarrows to pass each other comfortably, and the different parts of the work could be reached with a 3" plank from same. The excavation work was arranged so that the shafts, tunnels and

open trench in the cofferdams were ready and down to grade about at the same time. The pipe work was proceeded with by setting a 30" tee, capped on the lower end, at the bottom of the shafts, so that two gangs of pipe layers could work on each side, one laying in each tunnel from the tee, the other bringing up the stand pipes. All joints were made with lead wool caulked with pneumatic tools. Afterwards the joints on the inside were rusted as an additional precaution, for it was almost impossible to test the pipe in sections as laid, until the final completion, at which time most of it was covered up.

Allow me to mention that great caution must be used to either keep the plug out of the pipe end, or if left in, thoroughly weight the pipe, as it is laid, because in case of a bad leak, dam giving way or a flooding of the cut, the ends of your pipe will float up off the bed or blocks, and make a mess of things generally.



After the above sections were laid, we constructed a lock dam about a half a length of pipe back from the end of last pipes laid; the point being selected with great care where the rock was solid and as free from seams as possible. The dam, about 3 feet wide, was carefully filled with puddle clay, well worked down around the pipes and into the sides. We tried making it of concrete, and had a miserable failure, which lost us considerable time, not to mention expense. A sump hole was made in the end pocket formed by this new cross dam, so as to be able to keep the water below the end of the pipe. After pumps were placed in this pocket, or section, the water was let in to the long section to make sure it was tight, then partially pumped out again, and the back-filling carefully done up to the lock dam; after which the water was allowed to flow over the work and take its regular course down stream, the cofferdam being demolished as the back-filling proceeded. The shafts and tunnels had been filled while the lock dam was being made. As there was now ample room behind us on the south shore for the whole of the canal water to pass, we built in the remaining cofferdam, joining up the lock dam, in which was the dry end of the pipe, and the north cofferdam. After making this tight, it was pumped out, and the remaining rock excavation taken out. The ends of the two original dams were removed, the 8" pumps taking care of the water, and the two 30" pipes connected together near the center of the canal by two slip sockets or sleeves. All levels were run with an instrument by the engineer on the work, so that everything came together within half an inch. Just before the last connections were made, several inspectors and myself crawled clear through the pipes, to ascertain that everything was O.K. After connecting up, the back-filling was carefully done, and all cribs, dams, and material removed, and canal bottom leveled off; just in time to get out with our lives, for when we woke up the following morning the cannal had been refilled to its original level.

Our air compressor had then to be removed across the canal for the work ahead, and while the large connections and valves were being installed, work was proceeding westerly for 1,200 feet along the north bank of the canal, the pipe being laid with about 4½ feet of cover, the joints made with grouted yarn and cement, finished up with 1½" of lead wool caulked in with pneumatic hammers. I might explain, that an extensive swamp, or muskeg, intervened between the Lachine Canal and the Notre Dame de Grace Ward, which was the section of the city we required to serve, and also the best route to carry the gas along, back to the heart of the city. This muskeg was from 1,500 to 2,000 feet wide and several miles long, with a bottom of marl, boulders, gravel and quicksand, at depths from 5 to 25 feet, with several creeks and ditches running through it, some of which carried not only the ordinary drainage due to rainfull, but the drainage from the suburbs of Montreal West, Blue Bonnets, and part of Notre Dame de Grace and Lachine, one stream being called the Government Intercepting Ditch; another, the Little St. Pierre River. In addition to these streams, the Grand Trunk Railway main line ran down the center of the swamp, and they had also acquired a lease of the whole swamp from the Government, and have been gradually filling it in on each side of their center line, and have built 13 or 14 additional tracks, which now constitute their Turcot railway yards. The Park and Island and Lachine and Jacques Cartier Railway also had lines in this swamp, so that the services of the Railway Commission had to be called in to straighten out matters and allow us to cross this leased property; and an agreement as to the ways and means, depth, protection, etc., entered into with both the Commission and the Grand Trunk. As the material of the swamp was soft black muck of varying depths, overlaying white marl, we took elaborate soundings with rods of half inch gas pipe, after first running levels clear across on several crossings, said soundings being taken about 25 to 50 feet apart both ways, and extending over 1,000 feet each side of our canal crossing. After selecting the best crossing, which was also governed by the Right of Way, we were able to purchase from the swamp to the first road or street owned by the city. The data, plans, profiles and soundings were submitted and accepted by both the Commission and G. T. R. The crossing selected was 1,200 feet up the canal. The work along the canal was through good hard material, with no special obstacles encountered. The swamp crossing was then started, first crossing under the Park and Island and G. T. R. simplex siding, by means of an open cut, the tracks being protected by placing 16 x 24 long stringers under each rail before work was commenced. Next, the Government collecting ditch, 20 feet wide by 5 feet deep and running fast, was crossed under, by first making a sheet pile dam and sluice way. As the Government intended deepening this ditch, we were required to place the top of our 30" pipe 5 feet below the bottom of the ditch, thus making a very deep cutting, which at this point took us down into the solid rock, and it was several hundred feet before we got out of it again. I should mention that a transit line with stakes set every 50 feet, had been run clear across the swamp on the accepted line, and a little air pipe laid parallel to it, so that a connection for drills or pile hammer could be taken off it anywhere. As the trench proceeded, the sides were braced with 3" plank, and in some places sheet piling driven. As it had been decided, that on account of the shifting nature of the upper material, the pipe must be laid at least half its depth in the boulders composing the bottom, to prevent it pushing out of line during any filling the railways might do, great care had to be exercised in preparing this bottom, and our trench, as a matter of fact, was a running stream of white soup filled with boulders. This soup had to be taken care of with centrifugal pumps, and the bottom more or less planked over to form an even firm bed for the pipe.

We next encountered 12 tracks alongside the G. T. R. main line. All these tracks had to be supported on 16" x 24" stringers, and the open trench closely timbered as it was sunk. We had to go about 10 feet deep under these and placed our pipe on the solid bottom. The supporting of the tracks was done by the railroad people, who succeeded in not delaying any of their express trains

a single minute. The Lachine and Jacques Cartier branch was next encountered and crossed under at about 10 feet deep. From this point the hard bottom fell away rapidly towards the Little St. Pierre River which, at this point, was only indicated by a few bunches of grass and willows, and bog too soft to stand upon. The boulder bottom in the deepest place was at 15 feet, and it was necessary for us to get our pipes down below that, and as the bottom rose again a syphon had to be located at the lowest point. After considering the use of crib work, piling, etc., we first tried 2″ sheet piling in two rows about 8 feet apart, but these could not be driven into the boulders. And although a heavy timber frame was placed between the rows of piling and driven down as the excavation proceeded, as soon as we went down 4 feet the lower half of the piling bent inward, due to the outer pressure of the material trying to come in at the bottom, and in fact the surrounding swamp began to sink. We abandoned this and constructed caissons 12′ x 8′ of 8″ x 10″ and 6″ x 8″ timbers and 3″ plank 16 feet long, all sharpened at the bottom. These were placed and weighted with 4″ pipe and sunk as the interior was excavated. We managed to get the first one down 7 feet, then the pressure of the material on the sides prevented it going any further, and it would simply bounce as if it were in rubber, but could not be stirred. We finally made an outer shell of rough plank, the inner one being 3″ T. and G. The outer shell was fitted with 4″ guiding strips placed inside, vertically, at intervals of about 3 feet. These were planed and greased so as to do away with as much friction as was possible. As this outer case was made 6″ larger than the inner one all around, it allowed the inner case to slide down through it easily. Temporary braces were inserted to keep it in shape and prevent collapse before the inner caisson, which was heavily braced, was lowered into place. First, high shear legs were placed over the site and, as already stated, the outer caisson placed in position and weighted or driven about 6 or 7 feet. The interior was dug out or removed with pails and tubs as far down as possible, that is, until the material was so soft that it came in below faster than it could be taken out, when the inner caisson was swung into place and dropped inside and weighted and driven down until the boulder bottom was reached, after which the interior was more or less easily removed. As soon as the next 12 foot section was placed and emptied, a hole was cut through between them and a length of pipe laid. In all about twenty sections were required to be laid in this manner before the material was stiff enough to again resort to sheet piling with interior drop framing. This portion of the work was started in the old St. Pierre River bed, and being the lowest point both on the surface and on the bottom, the syphon was placed in the first caisson and work was carried on both ways from it. North of the syphon the bottom rapidly rose to good hard ground, and the regular open trench was sufficient with the aid of a few braces. As the swamp just crossed was about 100 feet below the first plateau along which we required to continue our branch to the centre of the city, a route had been selected up this steep bank at a point where a natural water course or gulley entered the valley, and a 15 foot right of way purchased. A line and levels were run and the grades established similar to the proceeding on railway work. The points of the hills were cut down and leveled off to a regular slope of about 32 degrees from the horizontal. This afforded us a road, and in fact was almost the only egress we had to the swamp along which to haul our material. Our pipe line was continued up to the foot of this hill, a special vertical bend put in and pipe line continued to the top, when another special bend was put in to bring us to a level line again. A 30″ gate valve was then installed in a concrete manhole and 50 feet more brought us to the Upper Lachine road where a 30″ x 24″ branch was put in on the end of the 30″ to allow for future extension, and a 30″ to 16″ reducer for the line back to the center of the city

I forgot to state that the caissons were back-filled for the first 6 feet with good hard material, mostly sand taken from the cutting up the bank, and as much of the black muck as we could find was used to complete the filling. We were as careful as possible to keep the marl and all vegetable matter away from the pipe, as we were advised by expert chemists that it would be highly detrimental to it.

The cost of the work, not including the canal crossing, was about $11.00 per foot, including everything except right of way. The force employed was about 120 men. Day and night work was done while caissons were being sunk.

The total length of the 30″ pipe line covered by this description was about 4,000 feet, and on the final test being applied it was found tight. It has now been connected up to the city system, and carries an average pressure of from 4 to 6 pounds.

Industrial Dependence on Petroleum.

[From the paper by JOHN D. NORTHROP, Associate Geologist, U. S. Geological Survey, to the Oil and Gas Producers' Association, of West Virginia.]

From the angle of their own particular vision, technical writers have variously characterized the period in which we live as the coal age, the iron age, the cement age and the motor age, or more broadly, as the industrial age and the age of power. A few, however, with keener vision, have looked behind the marvelous progress in numberless branches of industry during the last half century, and have termed this era the age of petroleum. The latter characterization appears to be the most appropriate, emphasizing as it does one of the world's greatest industries, and directing attention to a substance that finds use, either in the cruds state or in one or more of its countless refined forms, in practically every type of industrial activity. All over the world the production of petroleum has now become a matter of vital importance, and the ends of the earth are being searched for evidence of undeveloped supplies. New uses for petroleum and its derivatives are discovered every day, and new industries, depending wholly or in part on petroleum, are constantly being developed. Few people realize, to more than a slight degree, the extent to which we have become dependent on petroleum for the necessities and comforts of every day life, and it is doudtful if many oil producers could list off-hand more than a dozen uses to which their product is devoted. Even the automobile owner, who fondly fancies that the only tribute he pays to the petroleum industry is for motor fuel and lubricating oil, completely overlooks the fact that rubber substitutes derived from crude petroleum enter into the composition of the tires and of the glossy switches that decorate the dash board, that the varnish on the body of his car, the paint on the iron work and the polish with which he refurbishes the top, contain petroleum products, that the insulation on the ignition system is largely paraffin wax, and that the carbon elements in the electric batteries may be petroleum coke.

It is impracticable in a discussion like this, to consider in detail the industries depending wholly or in part on petroleum, and to point out the degree of dependence in each case, as it would involve considerable repetition. To avoid this, we will first consider crude petroleum, then in turn its principle refined products, and endeavor to show a few of the more important industrial applications for each.

Petroleum, in the crude state, finds little employment in the industries except as a fuel. Kier established a limited trade in crude petroleum for medicinal purposes in the early days of the industry in this country, but the material upon which he built up his trade has long since been displaced by products derived from it that are more efficient than the original material in the treatment of the diseases for which "Seneka oil" was so highly recommended. Certain grades of petroleum, small quantities of which occur in favored localities in West Virginia, in Ohio and in Pennsylvania, are natural lubricants, and as such are industrially utilized. Crude petroleum is also employed by the chemist as a solvent and by the cabinet-maker in producing decorative finishes. The use of viscous crudes in the flotation process for concentrating certain types of metallic ores, is a metallurgical application that has not advanced far beyond the experimantal stage.

The fuel oils employed in the industries include not only the heavier grades of crude petroleum, produced in California and in the Gulf Coast states, from which small proportions of the more volatile hydrocarbons have been removed by "topping," but in addition certain residues obtained as a by-product of petroleum refining. Up to a few years ago fuel oil was a drug on the petroleum market, its use being restricted to combustion under steam boilers in areas where a superabundant supply made such use an obvious economy. With the development of the Gulf Coast and California oil fields, however, there came a revolution in the fuel oil branch of the petroleum industry, the economic advantages of this type of fuel causing its rapid adoption in an ever increasing number of industries.

The industrial uses of fuel may be roughly classified under three general heads: (1), the generation of steam; (2). the direct generation of power, and (3), the generation of heat.

More than one-half the fuel oil consumed annually in the United States is utilized in the generation of steam. Locomotives are the principal consumers, their requirements in 1913 amounting to more than 33,000,000 barrels. Through the Gulf Coast States, along the Atlantic seaboard and in California, fuel oil is burned under stationary boilers in power plants and in innumerable industrial

plants of many types. In Southern Louisiana the Union Sulphur Company alone consumes more than 1,000,000 barrels of fuel oil annually in superheating the immense quantities of water used in the Frasch method of mining sulphur.

In maritime service the use of fuel oil under boilers is increasing. In 1914, the maritime department of the Long Island Railway at New York decided to convert its harbor fleet of seventeen tugs and lighters into oil burners, and recently we read of the success attending the conversion of the United States Fruit Company's passenger steamer, "Metapan," from a coal burner to an oil burner. For years oil burning vessels have been in successful operation in the Pacific coastwise trade. All battleships and torpedo vessels now building and authorized for the United States Navy are designed to use fuel oil exclusively, and it is estimated that the naval requirements of fuel oil during the current fiscal year will amount to at least 600,000 barrels.

The utilization of fuel oil in the direct generation of power is at present confined to its combustion in the Diesel type of engine, which is adapted particularly to stationary use and is becoming popular because of its efficiency and economy, despite its high initial cost.

Few people realize that nearly one-half of the fuel oil consumed in the United States is used for purposes other than the generation of steam. The cleanliness, ease of control, absence of soot and ash, and general economy of this fuel recommend it to a great number of industries requiring high and uniform temperatures. We find oil fuel in ever increasing demand in the metallurgical industries for smelting of copper, iron, lead, zinc and other ores, and in the subsequent refining and treatment of the metals. For these purposes some type of reverberatory or regenerative-reverbratory furnace is commonly used, though the past year has shown a decided advance in the successful application of oil fuel in direct cupola or blast furnace practice. Lime burning is now carried on with oil fuel where it is obtainable, and the economies that can be effected with oil fuel in cement burning and brick manufacture are well recognized. In the manufacture of pottery, porcelain and glass, the only rivals of oil fuel are natural and artificial gases. In Ceylon and India, tea drying is done in a special oven heated by oil fuel.

The domestic application of fuel oil has only begun. At Fort Baker, Cal., liquid oil is successfully distributed from central storage tanks to the barracks, officers' cottages and other buildings of the post just as gas, electricity, water and hot air in other places. A pressure of 30 pounds is all that is required to satisfy the varied demands of the community for boilers, hot water heaters, furnaces, ovens and other apparatus. The oil costs about 2 cents a gallon and shows a saving of 80% over coal for heating, motive power, cooking and general fuel purposes.

Hundreds of barrels of fuel oil and distillate are burned annually by the fruit growers of southern California to protect their orchards of citrus fruits from the devastation of early frosts.

A consideration of our industrial and domestic dependence on the refined products of petroleum allows a discussion of unnumbered achievements and almost unlimited possibilities. The scope of this paper admits only of what we term in the geological survey a "rapid reconnaissance" of this unbounded field. We will consider these products in the approximate order of their derivation.

Cymogene and rhigolene, which are gaseous at ordinary temperatures but become liquid under the influence of cold or pressure, find industrial application, the former in refrigerating and ice manufacturing plants, and the latter as a local anasthetic for surgical purposes.

Petroleum ether, or Sherwood oil, and ligroine are extensively used as solvents for fats and fatty oils in the pharmaceutical and chemical industries, and are extensively employed in the manufacture of rubber and rubber substitutes.

Gasoline and naphtha comprise the products of petroleum in greatest demand throughout the world to-day. The former is the principal fuel available for the internal combustion engine, the employment of which includes unnumbered industries in the scope. The automobile, motorcycle, motor boat, aeroplane, stationary engine, gasoline stove, lamp and torch include a few of the commoner avenues of gasoline consumption. The gasoline tractor on the farm and in the desert, the gasoline locomotive for tunnel and yard service on railroads and in mines, the internal combustion or Humphrey pump for irrigation and water supply, and the gasoline street car in municipal and interurban traction service comprise other less common but rapidly developing application of gasoline power that involve still further industrial interests.

Naphtha or Danforth's oil is available for use in the internal combustion engine, but also serves many industries not dependent on its B. T. U. content, where its less objectionable odor gives it an advantage over gasoline. The dry cleaner employs it for removing grease from clothing; the varnish maker, for dissolving the resins that are the base of his industry; the paint maker as a substitute for turpentine; the soap maker, in the preparation of laundry and toilet soaps; the printer, to clean his type, and the textile worker, in the manufacture of oil cloth and linoleum.

Of the illuminating or burning oils there is a considerable variety adapted to meet specific requirements. Kerosene is the most common, and its uses as an illuminant, as a source of heat, as a disinfectant, as a solvent and as a destroyer of fruit tree pests and mosquito larva are so well known that comment is superfluous. Kerosene is used to some extent as a source of gasoline, and is also being employed directly in internal combustion engines fitted with a special type of carburetor. "Headlight oil" and "mineral sperm oil" are specially refined types of illuminating oil prepared for specific purposes.

Intermediate between the burning oils and the lubricating oils are the gas oils which, as the name implies, find their chief utilization in the manufacture of oil gas or in the enrichment of other artificial gases. In the past decade the art of manufacturing gas from crude petroleum has advanced rapidly until modern oil gas is without doubt the most nearly ideal artificial fuel, being superior in many respects to either coal gas or water gas. It is interesting to note that this oil finds considerable use by manufacturers of coal gas to raise the candle power and increase the heat units of their products.

Of all the products derived from crude petroleum the group upon which all industries employing machinery are dependent comprises the lubricating oils. This becomes of increasing importance with every substitution of machinery for man power, and will be a vital issue upon the ultimate exhaustion of the petroleum fields. Efficient, though perhaps less convenient substitutes, embodying the properties sought in other petroleum products are known to be available, but for mineral lubricants we have no known substitutes. Vegetable oils are useful as adulterants in compounding lubricating oils, but alone their tendency to dry and gum limits their application to heavy work in the absence of steam. Animal oils are likewise limited in application on account of their tendency to disintergrate and form corrosive acids in the presence of steam or under high temperature. The mineral oils themselves consist of hydrogen and carbon in combinations fairly stable in the presence of steam and high temperatures, and in this lies their excellence as lubricants. The varieties of lubricating oil produced from petroleum number several hundred, according to the type of machinery and the climatic conditions involved, from the colorless paraffin oils to thick, viscous, almost black oils, with varying proportions of animal and vegetable oils compounded with the mineral base all along the line. Thus we have oils adapted for every conceivable purpose of lubrication, from the most delicately adjusted watches, laboratory balances and surveyor's transits, to the axles of farm wagons; from those that will retain their lubricating properties under tropical conditions, to those that remain fluid throughout an Artic winter; and from those that will adhere to rapidly whirling spindles, to those that will not segregate and drop off low speed shafts. Without those products of petroleum the "wheels of industry" must cease to turn, at least until our versatile chemists bring forth an efficient substitute.

About 20 grades of paraffin wax are currently produced from petroleum, ranging from the so-called crude scale wax, to the highest grade oderless and tasteless refined wax, this product finding utilization in a large number of industries. Let us consider a few of its applications. The candle maker probably uses more paraffin wax than any other consumer, and his finished product is perhaps more vital to the mining industry than to any other. Paraffin wax not only serves the miner as a light giver in the form of a candle, but as a coating for paper to keep his powder dry. Mr. L. O. Howard, of the Utah Refining Company, is authority for the statement that the entire output of wax from that plant, is shipped to the DuPont powder works. The confectioner employs paraffin wax in his trade, and the oil producer who invests a nickel in chewing gum is buying back a portion of the material that came originally from his wells. The paper maker employs paraffin for a filler and as a coating to render many grades of his product moisture proof. The textile worker adapts it to similar uses on cloth. The stone mason and the archeologist employ it for preserving stone from atmospheric weathering. The housewife finds it indispensible during the preserving season and uses it the year around in the laundry. The shoemaker depends upon it to wax his thread and the match maker to facilitate combustion of his wares. The electrician could not spare it, as it simplifies the problem of elec-

tric insulation, and even the school boy pays his tribute to the wax industry with every colored crayon he is prevailed on to use.

Closely allied with the lubricating oils and the waxes, are the greases, of which there are some 75 varieties, varying in color and consistency with the use for which they are intended. These are largely compounds of mineral oils with vegetable and animal products, and are primarily semi-solid lubricants familiar in various forms to the farmer, the liveryman, the leather worker, the motoist, the steam engineer, the bootblack and the theatrical performer the world over. Man's friend, petroleum, or as he familiarly terms it, vaseline, comes in the category of the greases. In the liquid form it is widely prescribed by physicians as a mild and efficient cathartic, and as widely used by the nose and throat specialist as a vehicle for protective sprays. In the semi-solid form it is used by the pharmacist in the compounding of innumeral pastes, ointments and salves for external and interal application. The paper maker applies it in the preparation of oil paper and the polish maker finds it useful in the manufacture of leather and even of metal polishes.

Petroleum asphalt, the residuum obtained in the refining of asphaltic oils, is becoming increasingly valuable as new applications are found for its use. The lighter grades of this product are termed road oils or fluxes, the former being utilized extensively for dust-laying, macadam road building and for road sprinkling in an emulsion of water, and for softening or fluxing natural asphalt or solid bitumens employed in the paving industry. The heavier grades, having a penetration of less than 100, are called residual pitches, and are used in the manufacture of roofing material, building paper, paint and waterproof felts, and find extensive application in pavement construction.

By forcing a jet of air through the residuum of asphaltic petroleum, semi-solid or solid, non-ductile, tenaceous products are obtained, which are utilized as paving cements, and, with further appropriate treatment are made up into substitutes for rubber. Thus the familiar disc of the talking machine, and the barrel of the fountain pen trace their ancestry to the oil well almost as directly as the lubricating oil that facilitates the revolution of the former, and the ink that fills the latter.

Did I hear someone question my implication that ink is related to petroleum? Let us see. What is the principal constituent of ink? Carbon. What is the residue left in the still after all the volatile constituents of petroleum have been driven off? Carbon, though it is usüally designated as coke. Petroleum coke, obtained in this way as a by-product in the manufacture of oil gas is, indeed, employed in the making of ink, and in addition enters into the preparation of leather polish, stove polish and certain grades of paint, though it finds its principal use in the manufacture of carbon for arc lamps and electric furnaces, and carbon elements for electric batteries.

We have yet to mention two products of petroleum, which until the last few months have been pretty generally disregarded on account of the small quantities available from this source, as well as the fact that processes for their extraction had not developed to the point af commercial feasibility. I refer to benzol and toluol, both of which have been obtained heretofore almost exclusively from coal tar. These chemicals form the basis of the dyestuffs industry and in addition yield derivatives that are the essential components of high explosives. The researches of Walter F. Rittman, a chemist in the department of the interior, in devising a process by which benzol and toluol can be recovered from petroleum are too widely known to require more than the briefest mention. Secretary Lane has already announced that the efforts to develop the Rittman process on a commercial scale in the experimental plant placed at the disposal of the interior department by the Aetna Explosive Company at Pittsburgh, have proved highly successful. Thus we see petroleum entering new fields of industry, wherein its applications are so varied and its products so diversified that volumes would be required to explain its uses.

A Warm Reception.

An employee of the Consumers Gas Company, Toronto, opened a door of the cellar of the home of Edward Morrison, to inspect the meter, and received a bullet in his wrist from a 32 calibre revolver attached to the door. He made a complaint to the police and Morrison was arrested on a charge of setting a spring gun. Morrison claimed that food in his cellar was poisoned with white lead some time ago by an enemy. Recently he found evidence that persons were entering his cellar, and in order to scare them away he set up the gun.

Distilled Feed Water.

C. F. HIRSHFIELD.

Boiler tubes and plates fouled with salts and other materials, left behind by the water converted into steam, have been familiar phenomena ever since the introduction of the steam boiler; and recognition of the disadvantages of such fouling came very early in the history of steam engineering. Unable to bring experience and technical knowledge to the solution of the problem, the early engineers adopted the only means at their command for combating the persistent formation of scale; they allowed it to accumulate to such thicknesses as they deemed permissable, and then shut down and emptied the boiler, chipped and scraped off the accumulations.

In the course of time various mechanical devices were produced for expediting the cleaning operation and making it less arduous, and periodic cleanings is still the lot of most power-plant boilers, although it would seem that we should have progressed beyond allowing the deposition of foreign materials upon surfaces from which they must be removed later at a considerable cost.

Many have so progressed, but in the majority of cases it has been merely from a condition of quiescent willingness to one of unwilling acceptance of the conditions. Efforts have been made to devise a process of treatment that would make the water deposit its burden of foreign material outside, instead of inside the boiler. Until quite recently these efforts have been along two lines, the water was either heated to a high temperature outside of the boiler, or it was treated chemically with or without heating. Heat treatment with live steam generally ameliorates conditions, but it can never be a cure. Chemical treatment has yielded all sorts of results, varying from an end product much worse than the raw water, to one almost perfect in comparison with the raw liquid.

Chemical processes treating the water before entrance to the boiler may be roughly divided into two general classes, upon the basis of the results they attempt to produce. In one class fall those that merely attempt to change salts that yield hard scale into salts that form soft, spongy deposits. In the other class are those that attempt to remove the objectionable materials from the water without substituting anything in their place.

Assuming satisfactory cost of operation, the latter method is, of course, far more desirable; but it should be noted that the perfect removal of all dissolved material by any such process is impossible. The so-called solid content of the water may be reduced to a very small quantity, but the process going on inside a boiler is cumulative; practically all the solids entering remain therein. Those that collect in the mud-drum can be removed from time to time; those thrown down in contact with the heating surfaces remain and must later be removed by mechanical or manual chipping.

It requires but a brief survey of the situation to bring out the added costs connected with such methods. The cost of chemicals and their handling and use must be added to operating charges. The cost of the vessels in which the reactions occur must be added to cost of plant and forever after take its toll of the gross receipts. Disposing of the deposits in vessels is an operating charge, and the maintenance of such vessels and their auxiliary equipment adds to the maintenance charges. At best, the boilers must be blown down periodically to get rid of the undesirable solids, and at the same time large quantities of heat are blown away in the water that serves to carry them. At longer intervals the boiler must be emptied in order that the heating surfaces may be properly cleaned, and all the heat stored in the water in the boiler and in the setting is wasted. And it must not be forgotten that this calls for the employment of more men, or the working of men overtime, as well as entailing the installation of boilers otherwise unnecessary.

Conditions in this respect are much better in a surface condensing plant than in a jet condensing or a non-condensing plant, because the solids brought into the system are limited to those carried by the relatively small quantity of make-up water. But even 2% of the total feed may bring in undesirable quantities of solids, when boilers are run at very high ratings, and the life of the tubes nearest the fire depends upon keeping their interiors almost perfectly clean.

In view of all this, distillation of the make-up water is worthy the attention of any plant big enough to warrant treatment, or where special treatment is imperative. The idea is comparatively new, and regarded with more or less suspicion, but it is already an operative fact and, as yet, no evil results have been recorded. Perfectly pure water has always been regarded as bad for boilers as water containing great quantities of solids; indeed, many say it is worse, because it pits the metal, while no permanent damage need occur because of deposit of solids.

(*Continued on page 378.*)

THE AMERICAN GAS LIGHT JOURNAL

Entered at the Post Office, New York City, as Second-Class Matter.

Telephone Call, - John, 2996. Published Weekly at 42 Pine Street, New York City. Cable, - Am-Gas.

E. P. CALLENDER, President and Treasurer.
F. A. SOUTHWORTH, Vice President.
CHARLES H. WADELTON, Secretary and Manager
SANFORD K. CAMPBELL, Editor.

NEW YORK, MONDAY, DECEMBER 13, 1915.

English Coke Market Crisis.

Professor Bone has suggested that in order to meet national demands for high explosives, a limit should be set upon the continuance of making coke in beehive ovens. The "Gas World," London, finds that the beehive oven operators are not a little troubled by the suggestion, and says in comment: "To do this without notice, and without, in certain cases, some form of compensation, would inflict unjustifiable hardship on individuals. We do not propose to go any further into the arguments that might be put forward on behalf of beehive coking, but suggest that every case should be dealt with on its merits. We are more particularly concerned with the arguments in favor of prohibition of beehive coking, as they would affect by-product ovens. There is a feeling amongst owners and managers of by-product ovens that they are being rather harshly dealt with, and in this respect they have the sympathy of those of the general public who are able to realize the position. Everybody knows that the Government requires the largest possible supplies of tar, benzol, toluol and ammonia. By-product ovens contribute a very large share towards the national supplies, and beehive ovens contribute nothing. All connected with by-product coking know how much they are being pressed by the Government to increase their output of by-products. "Build more ovens," they say; work heavier charges; employ higher heats—do anything, in fact, to increase supplies." This, of course, can only be done by incidentally producing more coke. Coke, indeed, is in danger of becoming a glut on the market. "Now," say the by-product people, "if we are to go in for increased production, which means increased wear-and-tear on our plant, the Government ought to help bear the burden." Labor costs are high; tar, apart from certain liquid products, is only bringing a low price; coal itself is very dear and scarce; and, lastly, coke is only fetching a low price. Now, the major portion of the revenue of a coking plant is derived from coke. The supply is greater than the demand. Part of the supply is derived from a source which is in no way contributing to the national needs during the present crisis. To the coke-oven man the attitute the Government should take is obvious. He says, "Shut down the beehive ovens. The coke supply would than be somewhat restricted, but all need can be easily met. Prices will be favorable to by-product oven people, and at the same time additional coal will be available for by-product ovens, and there will be additional supplies of by-products." This attitude may be a selfish one, but after all, it would be the country and not the individual that would benefit. The Chancellor of the Exchequer's war profit tax would prevent any nuisance of the advantage, and the country would stand to gain in every direction. We do not wish to convey for a moment the idea that there are no arguments against prohibition. There certainly are, and we would guard against injustice by submitting every individual case to the consideration of a special committee of experts. We should greatly esteem the views of any of our readers on this important topic. If ever a subject was worthy of a Royal Commission, this subject of the proper utilization of fuel is; and we hope that in the near future the Government will appoint a Committee of Inquiry which will include among its members some real practical coke-oven men."

New York Section, Illuminating Engineering Society.

The December meeting of the New York Section, Illuminating Engineering Society, was held in the Auditorium of the Consolidated Gas Company, on the evening of Dec. 8, Gas being the topic.

Those attending were welcomed by Mr. H. B. McLean on behalf of the company, and Chairman D. M. Moore then introduced Thomas M. Ambler of the Board of Managers, who has charge of the Membership Committee of the Section, and who outlined the Honor Roll plan that was carried on so successfully by him in the N. C. G. A. last year.

The first paper, "Residence Lighting by Gas," was presented by M. A. Coombs, of the Department of Utilization of the Consolidated Gas Company. The author called attention to the co-ordination of effort by the manufacturers of burners and fixtures, and the great improvements in mechanical features coincident with those in design and equipment; a striking example of the latter being the semi-indirect gas fixtures. Among the advantages cited in favor of gas lighting, as it is now being offered, he noted the low intrinsic brilliancy of the units themselves, and the extensive use of diffusing glassware. By means of slides, he showed many examples of modern fixtures that rank with the best products for electricity; which was followed by a demonstration of many of the units that are being sold by the New York companies, there being 13 portables, 16 brackets, 5 chandeliers and 5 semi-indirect units exhibited. Mr. Coombs said that the ease of control, artistic appearance and effectiveness were all that could be desired; and the applause which the exhibit received indicated that these results had been demonstrated.

The second paper, which followed immediately, on "Progress in Outdoor Lighting with Gas," was read by Mr. Charles I. Hodgson, Chief Inspector of the Commercial Department of the Brooklyn Union Gas Company. Store front and billboard lighting were the features taken up, the unit used being the outdoor gas arc. The success of this branch of his company's business is based upon service, and the author dwelt upon the things that are essential for holding the customer as well as getting the business. By means of slides, the appearance, equipment, fittings, magnet valve control maintenance, inspection, sales efforts, booklets, advertising, and their ten handsomely equipped gas offices, were shown, each being given due credit and consideration. The lamps are sold on an installment maintenance plan, for $1.25 a month for two years, or $30 total; and after this period most of the lamps are maintained under a regular maintenance contract. One installation, on a block 500 feet long, comprises 30 5-mantle units, each of which costs the store keeper $3.25 per month for gas on a 4-hour basis. In a combination installation it was found that the gas lamps are used every night of the week, while the electric installations were rarely lighted, except on Saturday night, owing to the expense. The manager of this particular property is boosting for outdoor gas lighting, as it brings more net revenue.

The discussion was opened by J. E. Bullard, of the Municipal Lighting Company, who said that gas lighting has not received sufficient publicity, and that neither the public nor the gas men themselves appreciate its possibilities. As an instance of the wrong kind of publicity, he cited a publication on the care of books, in

which the statement was made that gas was injurious owing to the effect of sulphur on the bindings. Gas men should not hide their light under a bushel, and electric men should not be afraid of competition, as more gas lighting means more electric lighting as well.

Norman Macbeth said that A. T. Stewart made his first success as a merchant by trying to sell the things that the public wanted. Not enough gas men have tried this method; they have tried to sell the things they themselves liked. The gas lighting installation in the Cathedral of SS. Peter and Paul, at Philadelphia, was noted as an example of what sales energy and engineering ability can accomplish. The only competitor that either gas or electricity has is darkness.

J. P. Hanlan said that gas men were never in better position to serve the public with lighting than now, with the appliances that are available. The Public Service Gas Company appreciates the value of publicity, and they are going to continue to spend money, time and efforts to acquaint the public with the newest burners and fixtures.

G. E. Smith said that the modern gas fixtures should be so labeled, because the public often thought them to be electric, not being informed of the great strides made in gas lighting. The gas solicitor is handicapped by the almost universal use of electricity in public places, and has done remarkably well under the circumstances.

The chairman asked for some statistics. H. Thurston Owens said that 50% of the gas sold was for illumination; and that neither gas nor electricity cover the urban field, as may be seen by noting the number of telephones in service, which always outnumber either. C. Brown thought that only 40% of the gas sold was used for illumination.

Thos. Scofield reported the results of several tests as to the increase in temperature due to gas lighting. They found that in the Consolidated Gas Building the temperature in the gas lighted portion showed an increase from 81° outside to 83° inside the rooms, while in the electrically lighted portion, with only half the quantity of illumination intensity, the increase over outside readings was from 81° to 81½°.

The January meeting of the New York Section, which will be devoted to optics, will be held on Jan. 13. There will be a paper by Mr. Cole Morgan on "Light Transmission in Optical Instruments," and another on "Optics," by J. B. Taylor.

The small attendance of electrical men at the meeting is an indication of the shortsightedness of the interests that dominate the Society, who claim to be using best efforts to get the gas men of the metropolitan districts to attend their meetings.

Empire State Association Meeting.

The December meeting of the Empire State Gas and Electric Association, at Amsterdam, N. Y., on Friday last, was held in the office of the Chuctanunda Gas Light Company. Chairman F. S. Dunn called the session to order at 10:30 A. M., having as his assistants General Manager Conlee, of the Chuctanunda Gas Light Company, and Acting Secretary Vonstarzenski.

The first paper read was that by R. J. Jennings, of Mt. Vernon, on "Pyrometry." Two other papers were presented, one on "Holder Heating" and the other on "Safety."

Among those present were, R. J. Jennings, C. B. Spates, J. H. Hallonbeck, H. T. Sugden, W. H. White, G. D. Conlee, W. H. Earle, G. Maguire, C. Meserman, B. O. Beard, H. C. Keefers, M. G. Welsh, G. C. Seidy, F. J. Skeva, J. R. Snyder, H. J. Johnson, J. F. Kivlen, A. E. Shippen.

This is one of the designated "gas meetings" of the Association, and developed a healthy appreciation of the "specialized" session.

No other details of the meeting could reach us in time for this week's issue.

[OFFICIAL NOTICE.]

Pacific Coast Gas Association.

445 Sutter Street, San Francisco, Cal.

To the Members of the Pacific Coast Gas Association: The very root, life-blood, and strength of an organization lies in its membership. Broadly speaking, this statement covers everything for good or ill, for with large and active membership, an association of men is bound to be of great and far-reaching importance.

The President of the Pacific Coast Gas Association, Frank A. Cressey, Jr., has appointed me Chairman of the Membership Committee, and I desire to point out to you a few reasons why every man who is at all interested in the gas industry should become a member of the Association.

Without doubt there are a number of your associates who are non-members, and it is my attitude that we are doing an injustice to those men by not encouraging them to become members. It is an injustice because, to a great extent, it hampers them in the successful pursuit of their vocation.

I am taking the liberty of presenting the following reasons why a non-member should become a member, and if you have any other suggestions along this line to make, kindly add them and use as arguments in bringing in new members:

The Pacific Coast Gas Association was organized July 11th, 1893.
It is twenty-three years old.
It has 390 members.
Among our members are some of the most able and formost men in the Gas Industry.
It is an Association of helpfulness to its members.
It stands for the best in the industry.
There is no initiation fee.
The dues are $5 per year.
Dues include bound copy of Yearly Proceedings.
It stands for progress.
It stands for education.
It maintains a chair of Gas Engineering at the University of California.
I maintains a splendid library, that is open to all members upon application to E. C. Jones, Librarian.
At least once a year the members are priveleged to get together, to hear and discuss papers written by experts in their line, on matters of vital import to our business.
These meetings encourage a spirit of good fellowship.
They bring together men of like thoughts.
An exchange of ideas is brought about.
Theories are either whipped into practice or discarded.

Every man engaged in the gas business, whether in the manufacturing, operating, accounting or sales department, owes it to himself, his advancement, the welfare of his company, and his loyalty to the industry that makes it possible for him to earn a living, that he belong to an Association that stands for every thing that tends to his good.

The Pacific Coast Gas Association stands for all that.

The Membership Committee, as it now stands, is composed of fourteen members, but in reality it comprises every member of the Association. Therein lies the strength of our efforts, and depends what kind of a record the Membership Committee will be able to make and report at the next meeting.

There are 390 members of the Association. Is it too much to ask that you, as a member in good standing, should bring in two new members this year? If every member would perform but that one duty during the year, don't you suppose he would feel that he was in very truth an active and not just a passive member?

The Pacific Coast Gas Association has proven that it knows how to do things in a big way, and now let us see what we can do in this new membership campaign.

With best wishes for success, I remain,

Very truly yours, C. B. BABCOCK,
Chairman, Membership Committee.

(*Continued from page 375.*)

Distilled Feed Water.

Investigation apparently shows that perfectly pure water has no effect upon properly made boiler steel, except a slight dissolving action, so slight that it need not be considered in connection with the longest lived boiler on record or to be expected. The pitting action ascribed to it seems to be due to dissolved carbon-dioxide.

It is, therefore, of interest to study the methods used for distilling the make-up, and to determine what characteristics adapt them for use under different typical conditions. At the outset, it must be remembered that the use of distilled make-up is applicable only to surface condensing plants.

One of the simplest methods, though an imperfect solution, is applicable only to plants having a comparatively large number of boilers. It consists of feeding all the make-up, with or without chemical treatment, to one boiler of the battery; all the other boilers getting steam, that is, as distilled water. Blow-down and turbining are confined almost entirely to the one make-up boiler, the others being blown down and cleaned only at very widely separated intervals.

In plants operating on a perfectly steady or a regularly swinging load, the make-up required is practically constant from minute to minute and from hour to hour; and regulation of the feed to the make-up boiler in an installation is a simple matter. In plants which give a load curve with marked and widely separated peaks and hollows, the regulation of the make-up is not so simple, because the system throws out great quantities of water during peaks, when ebullition in the boilers is violent, and needs equally great quantities during light loads when the ebullition is mild, and the water level in the boilers, therefore, sinks. The only solution seems to be a hot well large enough to store a quantity of water sufficient to equalize the demands of the system. And it should be noted, that the hot well, for best results, should be constructed to prevent, as far as possible, the absorption of air and carbon dioxide by the stored water. It has been suggested that storage under a blanket of steam at atmospheric pressure, will accomplish this.

The use of one or more make-up boilers is the only method capable of utilizing the heat of fuel directly for the distillation of the make-up water. It would be possible, of course, to construct a fuel-heated still, but in any feasible form, to all intents and purposes, it would be the equivalent of a make-up boiler.

At first sight it would seem advisable to use waste heat in some way to distill the make-up. Consideration of the heat wastes in a surface-condensing plant show only three sources possibly available; heat carried away in the circulating water, heat in the steam exhaust from auxiliaries or main units, and heat in the chimney gases.

It is obvious that the heat in the circulating water cannot be used because of its low temperature. Steam exhausted from the main units is also at a low temperature, practically corresponding to the vacuum in the main condensers, and could not be advantageously used for distillation; because, even if a much better vacuum could be maintained in a vacuum still than in the main condensers, the difference between the temperatures of the main exhaust and of the water distilled would be so small as to necessitate the use of enormous surfaces with their high capital charges. It does not seem probable that the heat in the exhaust steam from the main units will ever be used directly for the distillation of make-up, but it is possible that the water on its way to the still might pass through tubes immersed in the main exhaust, and be preheated 10° to 25°.

The exhaust from the auxiliaries generally has a temperature near 212°, and this gives an appreciable temperature head above that of vaporization into a good vacuum. This is possible by connecting the vapor space in the still with the steam space in one or more of the main condensers, but it would result in leading into the main condensers all the air liberated by the distilling make-up, and this certainly is not desirable. It would also entail additional vacuum piping, with the recognized difficulty of keeping such piping tight.

A separate condenser and pumps for the still is possible, though it would be expensive. However, a combination feed-water heater and auxiliary condenser, as installed in two large stations recently constructed, offers a solution of the difficulty, provided there are any steam-driven auxiliaries that exhaust steam at or near 212°. The heater-condenser usually installed in stations of this type are used for heating the boiler feed with exhaust steam from the auxiliaries, and under such conditions there is no exhaust steam of 212°; but probably enough auxiliary exhaust about 212° can be had to heat the still and then discharge into the heat condenser.

The temperature difference available would not be very great at best, because the temperature in the heater condenser would be at least 120° to 140°, and with so low a difference, large surface and, hence, costly apparatus would be required.

There still remains the heat in the chimney gases to consider. If economizers are not used these gases may be expected to range between 400° and 750° F., depending upon the ratings at which the boilers are operated. If economizers are used the gas temperatures will be lower, but still high compared with the temperature of raw water entering a still. But metal surfaces exposed to flue gases may not be lowered below about 120° if sweating and rapid deterioration are to be prevented, and the make-up water would have to be heated slightly higher than 120° before being introduced into the gas-heated still. It would be possible to raise the water to such a temperature with exhaust steam; but this would mean the installation of a water heater in addition to the still, and a great deal of piping and possibly an additional pump, so waste heat in the flue gases does not look promising. It should also be noted that a gas-heated still would require much larger surfaces than if heated by steam, because of the low rate of heat transfer between gas and metal. Apparently then, although waste heat for the distillation of make-up offers possibilities, it does not seem likely to be adopted until some simpler solution is available.

However, high-pressure steam is always available in a steam plant, and gives a good temperature head above the water vapor at vacuums available, and even at atmospheric pressure. This fact points toward small surfaces and, therefore, inexpensive apparatus, and on such grounds the use of high-pressure steam seems to promise well. On the other hand, high-pressure steam carries heat for which fuel has been expended, and if this heat is not returned to the system its loss would go far toward balancing the cost of the larger surfaces required to utilize waste heat along the lines previously suggested.

The exact form of the system naturally depends upon the type of station and apparatus. It may be well to consider some of the possible arrangements,

Probably the commonest plant is one using open heaters operated at atmospheric pressure, and utilizing exhaust from the auxiliaries to heat feed water. In such a case a still heated with live steam can distill the make-up into the steam space of the feed-water heaters, and the condensed high pressure steam can be trapped to the same heaters, to the boilers, or to the hot well. In this way all of the heat carried by the high pressure steam can be returned to the system, except that lost by radiation and blown out in the sludge that gradually collects in the still. The thermal efficiency of such an arrangement can be shown to be of the order of 90% or better, and it is highly satisfactory. Moreover, it is capable of further improvement at slight cost.

If there is sufficient exhaust steam available to heat the feed water to 212°, every bit of heat carried into the heater by the the make-up vapor may be said to displace just that much exhaust steam heat, and thus cause a loss. The function of the still is to heat the make-up water to vaporizing temperature and then to vaporize it. The vapor formed contains much more heat than would be required to raise an equivalent weight of water to the temperature of vaporization. If the still were made in two parts, one might be used to heat the incoming water by the outgoing vapor, and the other for vaporizing the preheated water with live steam. Because of the temperature heads involved, this arrangement would require more surface; but it would prevent waste of exhaust steam and require the use of less high pressure steam and, therefore, smaller steam pipes and losses. It is impossible to make a general statement regarding the desirability of such a two-stage system; calculations based on conditions must decide for or against it.

The make-up water will always contain some air, and if the vapor formed in the still is led to the feed-water heaters, most of the air will accumulate there. This need not lead to difficulties as the same thing happens when feed water heaters are used, and the air is simply disposed of by properly venting the heaters. Most of the air contained in the make-up water will be given up as the water is heated to vaporizing temperature; therefore, if a preheater, as above suggested, is used, a great deal of air will be removed at this point, and need not pass through the still or enter the open feed-water heaters.

An interesting development of the plant with steam-driven auxiliaries and open feed-water heaters, is that mentioned above as containing a heater-condenser. This is nothing more than an open heater arranged in the shape of a jet condenser, or, putting it the

other way round, a jet condenser used as an open heater. Obviously, all that has been said of the open heater installation applies to this form of apparatus. The heater-condenser will yield an additional advantage. As the pressure carried within the heater is generally quite a bit lower than atmospheric, the heat to be transferred in the still will be less, and the temperature head will be greater than in the case just discussed. This would result in less consumption of live steam and smaller size still. Another minor advantage, but still worth considering, follows from the fact that the heater-condenser is operated under a vacuum and fitted with an air pump, which gives a ready means of removing the greater part of the air that enters with the make-up vapor.

There is another method available for disposing of the make-up vapor, but it does not seem as desirable as condensation in a feed-water heater. If the prime movers are steam turbines, their lower stages will operate at pressures below atmospheric, and the steam from the make-up still can be introduced into an appropriate stage and made to give up some of its heat in the form of mechanical or electrical energy. However, this method is not desirable for two reasons: First, and most important, the heat converted into useful energy will be a small fraction of the total carried by the vapor, and the greater part of the heat content will be thrown away with the circulating water; second, all the air accompanying the make-up vapor must, of necessity, find its way into the main condenser and add that much to the work of the air pump.

Thus far little has been said of the distilling apparatus itself, attention having been almost entirely confined to the source of heat and to the disposal of the make-up vapor. The apparatus offers an equally great number of modifications.

In general it may be said that the small plant that distills the make-up with steam heat, will use the smallest and cheapest form of still or evaporator in order to keep down the capital charges. On the other hand, the very large plant can afford to pay for high thermal efficiency, and the type of evaporating apparatus adopted may be expected to be more complex and costly. It is possible that triple-effect evaporators working between convenient pressure limits might be used in large stations where a rather large and a practically constant supply of make-up water is required. Such an outfit, combined with a proper preheater and other devices for the conservation of heat shows, on paper, a very low cost of make-up per thousand gallons, and is apparently worth considering.

From what has proceeded, it is obvious that the consideration of distilled make-up opens up a very interesting set of problems, and that the possible combinations are numerous. As always, there is one best solution for each set of conditions, but experience in this field is so limited that it is impossible to discuss the matter in more than generalities. It is to be hoped that the many seeming advantages of distilled make-up will lead to widespread discussion of the subject with the usual beneficial effects upon the development of the art.—Abstract from "Engineering Magazine."

ECHOES OF THE SHOW AND CONVENTION.

MR. JANSEN HAINES,
President National Commercial Gas Association

Mr. Haines is President of the Des Moines Gas Company, Des Moines, Ia.; and a member of the American Gas Institute, the Iowa District Gas Association, and the Michigan Gas Association.

The attention the exhibits received demonstrated that the manufacturer obtains the greatest benefits when the public is not admitted to the show. Likewise the gas man receives the greatest benefits, as he can visit the booths without the accompaniment of the insistent clamor of the souvenir hunter.

The members of the Manufacturers' Section were in evidence by their handsome buttons and similar manners. The men who make the gas burning appliances are beginning to assume their rightful place among the leaders in the commercial side of the business. They ran the show in a business-like way, and there were no kickers.

Owing to press of business, the recently elected President of the Section, Mr. R. K. Clark, was unable to take up the work, and W. Griffin Gribbel was elevated from Vice-President to President. His successor in the former office is George F. Pennel of the Union Stove Works.

The visiting ladies at the Convention had a pleasant surprise on Thursday evening, each one received a half dozen beautiful chrysanthums—a gift from the Manufacturers' Section.

The rule as to souvenirs was not evaded at the whist party for the ladies, by the clocks in leather cases given to the players. The idea was that each lady should receive a prize. They were much appreciated by the recipients.

One of the visitors at the show, Mr. Robert E. Livingston, Director of Publicity of the New York Consolidated Gas Company, said in an interview:

"I believe that gas companies will use the newspapers more freely for advertising than they have.

"The futility of cheaply printed circulars and postcards to increase business has been pretty well demonstrated. They do not make waste paper baskets large enough to hold them all. Men and women are not going to read eight or ten cheap circulars found in the morning mail to get down to a letter that is of some consequence.

"Newspaper advertising is productive. In New York in four weeks we have sold 60,000 gas lamps, and the advertising was confined exclusively to the morning and afternoon newspapers, and our own monthly publication, 'Gas Logic.'

"Properly constructed advertisements prove as interesting as the columns in the 'news pages.' With the revival of business prosperity there has been a corresponding increase in newspaper advertising and the volume will roll up automatically. With gas companies, as with other businesses, you will find the newspapers patronized to a far greater extent from now on than ever before."

Like all educators, Dr. Galloway has his weather eye open for windfalls. The paper he presented asked that Presidents of big Gas Companies be appointed as an advisory board to the Board of Educational Control, their duties apparently being to look wise and contribute. That more funds than have been set aside will be needed was also hinted at in his report. We do not believe that the educational work should go along any faster than at present, and objectionable methods of solicitation should be avoided.

The members from the West and Middle West were notable for their absence.

One thing the Finance Committee in their Report revealed, was that the expense of printing the Bulletin was $5,300. As there are 2,692 members, it takes $2 of each member's dues to pay for the Bulletin.

Those who sat down at the "Meeters" banquet were:

Guest Table.

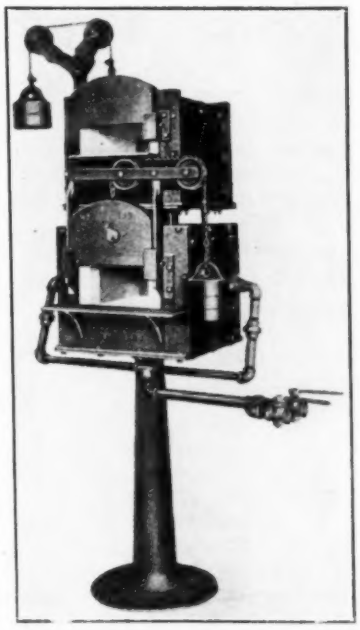
Stanley Grady,	W. H. Pettes,	S. J. Franklin,
Alexander Sinai,	I. W. Peffly,	W. R. Rhodes,
Harry P. Dains,	J. P. Conroy,	B. M. Larraway,
Fred'k K. Wells,	J. M. Brock,	J. C. Rushin,
J. T. Lynn,	Robert J. Rolston,	R. K. Clark,
C. H. French,	Wm. J. Clark,	A. R. Burr,
Lee Galloway,	F. R. Hutchinson,	Geo. H. Scranton,
Louis Stotz,	H. B. McLean,	H. H. Richman,
L. S. Bigelow,	Will W. Barnes,	E. Pratt,
S. Tully Wilson,	L. R. Dutton,	H. Thurston Owens.

Hagen Leimer,	J. N. Aninsman,	H. D. Mercer,
F. C. Thomas,	Thos. G. Allen,	D. C. Gutshall,
R. O. Ennis,	J. Calhoun Smith,	Wm. H. German,
H. B. Kerr,	H. Forrest Smith,	S. T. Sloane,
W. W. Kendrick,	R. H. Lee,	R. V. Dodge, Jr.,
L. G. Eiseman,	A. Brandriff, Jr.	N. W. Belmuth,
W. L. Seib,	J. F. Reeder,	B. Chesler,
J. B. Taylor,	Francis Engel,	Henry Popkin,
J. F. Roche,	E. U. Rosenbaum,	Lucien Comean,
C. E. Moore,	H. S. Fife,	R. M. Thompson,
C. W. Flanders,	W. P. Baylie,	Norton McKean,
J. H. Moriarty,	T. Carney,	E. W. Allen,
M. W. Kelly,	Thos. E. Bullion,	C. D. Slimpin,
D. D. Ransdell,	L. E. Cass,	J. D. Fowler,
James A. Colgan,	W. R. Epp,	A. F. Glaessner,
Jack Sayer,	E. F. Davis,	C. A. Learned,
N. P. Hutchinson,	L. Schlosh,	Theo. H. Piser,
D. H. Davenport,	W. A. Post,	Waldo A. Learned,
W. H. Gill,	H. W. Christmas,	W. G. Africa,
J. F. Magee,	W. H. Rogers,	Chas. T. Aaron,
H. V. Collins,	W. L. Secord,	H E. Norton,
James Wheeler,	F. F. Ingwall,	C. E. Lasher,
H. B. Halley,	F. R. Cutcheon,	R. Buckminster,
C. F. Lemmon,	Gus Martig,	L. A. Sprague,
E. C. Estes,	H. W. Danser,	Wm. A. King,
A. N. McBee,	H. H. Abbott,	C. H. Bowman,
C. A. Peterson,	F. C. Butler,	Victor Tyler,
T. C. Samy,	E. P. Shearer,	S. W. Brown,
J. C. Aaron,	A. A. Smith,	E. C. Drawbaugh,
P. H. Dale,	J. B. Jones,	G. T. Eldridge,
A. F. B. Harraden.	Walter Owen,	L. E. Dreman,
B. C. Doyle,	R. E. Joyce,	J. J. Lynch,
J. A. Kucera,	R. W. Lee,	Oliver B. Davis,
John S. Fox,	L. A. Shames,	C. E. Carroll,
E. H. Rodgers,	C. L. Howie,	J. P. Maxwell,
S. B. Stewart,	C. H. Orpin,	E. J. Carpers,
Jackson Duff,	John C. Price,	H. L. Schutt,
Emil Korthaus,	W. P. Moran,	E. S. McGraw,
D. M. Evans,	C. W. Whittington,	Otto Spahr,
C. I. Hodgson,	Thos. B. Hopper,	Max Kelley,
J. M. Coles,	Geo. M. Whitwell,	D. L. Frank,
L. Guldbransen,	H I. Rothbrock,	L. J. Strause,
T. J. Smith,	S. N. Whitwell,	William Lambert,
E. M. Colquhoun,	C. R. Cranmer,	Norman Macbeth,
John J. Shannon,	C. P. Carpenter,	H. K. Landis,
W. F. O'Donnell,	Rawlins Hume,	M. R. Lamb,
Frank Carpenter,	Ralph Baldwin,	F. P. Duggan,
Leon H. Ware,	R. Mc. Baldwin,	R. J. Halloran,
J. A. Langelier,	R. C. Green,	L. C. Heiss,
G. W. Radcliffe,	S. H. Kremer,	I. H. Fink,
R. A. Bartholomew,	S. E. Chubbuck,	G. A. McKinney,
W. T. Snow,	E. H. Lackaye,	C. L. Hoffman,
George Sligo,	E. M. Dulgnan,	H. F. Frey,
James McCave,	P. W. Sampson,	H. Conrad,
D. G. Calder,	F. G. Howe, Jr,,	J. W. Crankshaw,
D. M. Shaw,	H. D. O'Brien,	W. A. Buerkle,
E. R. Guard,	L. Gaston,	R. C. Frampton,
T. M. Mayer,	H. R. Stephenson,	J. L. Thomas,
De Witt C. Hart,	N. J. Dicks,	B. W. Dole,
J. Warren Guise,	A. W. Young,	W. M. Halsey,
F. W. Rawlins,	H. O. Loebell,	B. Kay Johnson,
M. J. Goldbas,	G. R. Trumpell,	N. H. Potter,
J. P. M. Greevy,	G. S. Speaker,	F. C. Smith,
W. J. Cahill,	H. S. Rowley,	A. B. Scheer,
W. Q. Hunter,	C. S. Murdock,	E. G. Jones,
S. B. E. Thompson,	R. A. Lovett,	W. Cowslip,
C. Riddleberger,	S. J. Newcomer,	C. F. Timms,
R. P. Crawford,	A. Summer,	L. J. Potter,
L. N. Yeter,	A. S. Hardy,	H. H. Richman,
L. W. Rice,	S. C. Singer,	W. S. Foss,
S. Snyder,	F. C. Craven,	T. W. Colyer,
A. F. Reitemeyer,	M. C. Overley,	D. C. Bull,
C. C. Denton,	E. C. Sethart,	F. A. Tuttle,
Morton G. Neff,	R. L. Magnus,	R. Xylander,
H. J. Baker,	C. E. Mead,	H. J. Long,
J. Brandes,	H. L. Coleman,	J. S. Mullarkey,
G. J. Schoenfeld,	A. Hovey-King,	H. W. Edmund,
Louis J. Platt,	H. H. Allen,	Sidney G. Vego,
J. P. Zingg,	R. W. Trump,	R. L. Mitchell,
M. E. Shreve,	Larmour Adams,	R. C. Fowler,
H. H. Newman,	Charles Freund,	C. D. Ten Eyck,
A. C. M. Azoy,	A. C. Tartzell,	K. Kenney,
E. L. Schultz,	L. J. Sullivan,	E. D. Brewer,
E. F. Goggin,	V. A. Miller,	Carl W. Muhly, Jr.
R. J. Jameson,	C. D. Freeman,	G. D. Henderson,
O. C. Noller,	Fred. R. De Voe,	G. G. Brown,
G. M. Kirchmer,	T. R. Vivarttas,	Chas. B. Hindon,
Hans Geolich,	A. C. Lord,	J. R. Stetser,
B. H. Gardner,	E. H. Schmidt,	W. O. Weekes,
G. W. Gatehouse,	J. B. Hayward,	W. H. Kratzer,
B. D. Harriman,	R. A. Sanborn,	T. N. Flanner,
J. D. Caldwell,	E. R. Robbins,	J. J. Bonner,
R. H. Burdick,	R. F. Crowell,	Paul J. Delaney,

S. P. Cobb, Noble L. Clay, M. J. Cullen, C. L. Farfield, N. G. Phelps, O. G. Iden, C. L. Lyon, R. B. Johnson, H. R. Cook, Jr., Howard Hoffman, J. C. Bowery, Alan E. Lockwood, W. H. Matlack, Jr., J. E. Nason, H. O. Anderson, C. A. Laird, G. G. Park, I. H. Entwisle, F. R. Cupin, George E. Smith, Ralph A. Harris, L. G. Watson, Herbert Stewart, Howard Lyon, Robert E. Kain, John L. Mathy, Gordon C. Hall, C. R. Jones, B. von La Rue, J. L. Larkin, W. F. Webster, J. E. Talbert, C. A. Campbell, R. L. Wright, A. F. McKay, W. P. Shields, C. T. Heitz, J. H. Howard, J. H. Gaylord, Roy Ammerman, E. G. Russell, F. W. Fitch, F. H. Schultz, Peter Fleury, B. B. Yeomans, Charles Dowd, William Hellen, I. Lundgaard. J. P. MacSweeney, John B. Daly, F. A. Hays, E. C. Roberts, H. B. Chandler, P. M. Wharton, Jos. W. Lynch, T. D. Wharton, M. P. Roper, H. Caskin, Alfred P. Post, C. A. Young, Paul T. Esquerri, A. H. Humphrey, B. B. Ferguson, H. H. Ganser, R. W. Rogers, W. G. Hendersholt, Philip Well, G. R. Malley, C. B. Hartman, W. F. Downs, E. C. Romine, W. F. Baker, Charles E. Smith, W. Rawson Collier, Frank Hammond, William F. Reid, H. B. Pitts, W. J. Callanan, J. V. Landreth, E. B. Crady, F. J. Bullard, J. Vanden Bom. G. R. Peck, Oscar Heckert, W. A. Morris, M. M. Milton, C. L. Henderson, S. H. Hale, Tom Hulsey, J. B. Ricketts, Milt Saul, Albert B. Kelley, F. G. Corbus, J. Scott Anderson, T. J. Moran, Frank Hellen, Wm. F. Croston, Edgar Morris, Geo. M. Millspaugh. George B. Hodges, Duncan A. Worrell, A. F. Lavelly, Ed. E. Myers, J. F. Wholey, I. A. Pink, J. C. Grey, John S. Welch, Wm. R. Lunn, W. R. Killinger, Herbert Graffis, A. E. Creviston, C. B. Hanley, J. R. Strain, G. M. Howsmon, Charles J. Fox, George M. Dolley, B. K. Cash, S. M. Hemphill,

New Methods and Appliances.

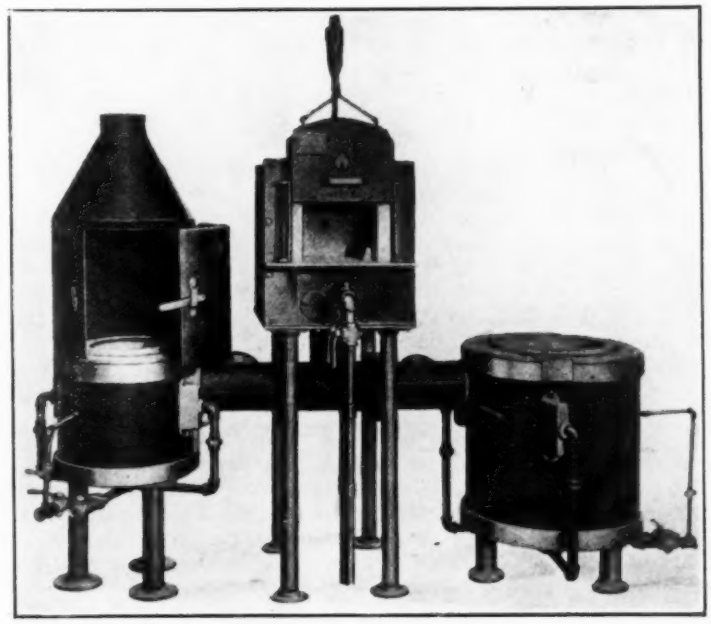
HEAT ECONOMIZING FURNACES.—Some new types of furnaces for high-speed steel tool work and for cyanide and lead hardening, designed to save labor and fuel in heat-treating work have been brought out by the Bellevue Furnace Company.



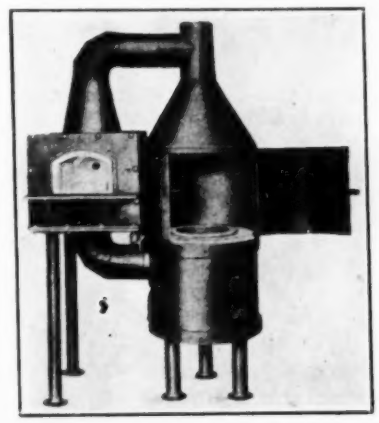
A Gas-Heated Furnace for High-Speed Steels; With Preheating Oven Warmed by the Exhaust Heat from the Main Chamber.

One of these is a furnace for high-speed steel, with a preheating oven utilizing the exhaust heat from the main chamber. The preheating oven is located above the exhaust heat carried to it by two clay tube ducts. The burners are located in grooves in the lining, at the sides of the hearth, so that the flame does not come in contact with the work.

A combination furnace for general tool work, and cyanide and lead-hardening furnaces is illustrated. The tool furnace is heated by the exhaust heat from either the lead or the cyanide pot or both. The heat passages from the latter to the tool furnaces are 5″ in diameter, clay lined. Outlets are provided so that when both the cyanide and the lead furnaces are in operation and the heat from only one is required for the tool furnace, the exhaust heat from either the cyanide or the lead furnace can be discharged outside. The tool furnace has an independent fuel connection and burners, so that it can be operated independently. The lead pot shown is 16″ in diameter and 16″ deep, the cyanide pot is 10″ in diameter and 10″ deep, and the heating chamber of the tool furnace is 11″ wide, 18″ deep and 10″ high. This furnace is not designed for heating high-speed steel, but it can be converted to high-speed steel work by adding additional burners. When not used as a preheater it can be used for heat treating carbon steel; the exhaust heat brings the temperature up to 1500° or sufficiently high for carbon steel without the use of additional burners. The last cut shows a cyanide furnace with exhaust preheating oven. It is claimed that with this furnace, steel can be properly preheated before immersing in the bath, thus assuring a high production and keeping the cyanide bath under more uniform temperature than were cold steel immersed in it.



Combination Furnace for General Tool Work and Cyanide and Lead Hardening, the Exhaust Heat from the Latter Pair Utilized to Heat the First.



Cyanide Furnace with a Preheating Oven Heated by the Exhaust.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

IN Friday morning's golf tournament at Washington Glenn R. Chamberlain, of Grand Rapids, won the President's cup with a net score of 81. G. R. Philler and C. W. Wardell, of Philadelphia, tied for second place with 85 each. There were 32 entries in the handicap.

THE Western Gas Construction Company, Fort Wayne, Ind., has been awarded the contract by the City Council of Sherbrooke, Que., for the construction of a water gas plant. The price, $30,980, is exclusive of the holders, which will be built by local ironworkers.

WHILE at the recent convention of the N. C. G. A., we heard the name of the versatile superintendent of the Fredericksburg, Va., gas works mentioned more than once. It is locally known that under his management, not only has the price of gas been materially reduced (from $2 to $1 per 1,000 now, which is saying a great deal for so small a place such as the little old colonial city named is), but the output has been more than trebled, in the face of two competing electric light plants. Mr. B. F. Bullock has rarely been heard at the sessions of the various gas associations of which he is or was a member, for he is of a very modest and naturally retiring disposition; but that he enjoys considerable popularity was evinced by his election to Eminent Commander of Fredericksburg Commandery of Knights Templar, and Right Excellent Deputy Grand High Priest of the Grand Royal Arch Chapter of Masons of the State of Virginia, only a few months ago.

THE U. G. I. Safety Rally at Witherspoon Hall, Juniper and Walnut streets, Philadelphia, on Tuesday, December 9, was presided over by Mr. Samuel T. Bodine, president of the United Gas Improvement Company. Hon. John Price Jackson, Commissioner of Labor and Industry, State of Pennsylvania, spoke on what "Being Careful First" means to workmen. Short addresses were made by W. H. Gartley and W. J. Serrill. Among the motion pictures shown were new films "Be Careful First," "How to Avoid Accidents" and "First Aid for Persons Overcome by Gas." all the scenes enacted by employees of the company.

A GAS franchise at Walden, N. Y., has been granted to W. H. Fritchman and Jno. F. Moffett, to run for 40 years. The town has grown just 30% since the census of 1910. Two manufacturing plants are understood to be ready to contract for a take of 10,000,000 cubic feet, and about 800 domestic consumers have agreed to take gas.

THE Stacey Manufacturing Company were awarded the contract for the five 40 feet diameter by 100 feet high steel tanks, to be built for the City of Cincinnati in connection with the water distribution system. In addition to these tanks, this company received orders during the past month for some very extensive gas holder work.

THE Master of the Royal Mint, London, announces that because of the exceptional demand for silver coin in connection with the Navy and Army pay, and other demands to which priority should be given, it will not be possible for him to issue bronze coin to anything like the usual extent. He is therefore appealing to the gas undertakings to, if possible, arrange for collecting from pre-payment meters at more frequent intervals than at present, in order that the bronze coin be returned to active circulation as speedily as possible.

E. C. CONNETTE, President of International Railways Company of Buffalo, has been elected Vice-President of the United Gas and Electric Corporation and President of the United Gas and Electric Engineering Corporation. Francis T. Homer, of Bertron, Griscom & Co., has been elected Vice-President of the United Gas and Electric Corporation.

THE improvements at the gas plant of the Rochester (Minn.) Light, Heat and Power Company, which have been under way for some time, are commencing to reach the completion stage. The new boiler has been set and fired, and the new water gas machine is being installed. It is expected that it will be in operation by the first of the year.

THE Bulletin of the Union Gas and Electrical Engineering Corps, in a recent issue contained a cut of the marker of the first gas plant in Bloomington, Ills. This marker was found on West Market street on the site of the old gas plant and is inscribed: "Bloomington Gas Works. Erected by Asahel Gridley 1867." "In excavating recently at the site of the old Bloomington gas plant on Market street, the corner of a large stone was discovered upon which appeared the letter 'S'. Further excavation and examination disclosed a large semi-circular stone about 5 feet wide and 4 feet high, bearing on its face the name of the original gas company in Bloomington, with the date and founder's name. The old landmark has been moved to the site of the present gas works, and installed as a monument."

AT a hearing before the Indiana Public Service Commission, the Citizens Gas Company, of Indianapolis, protested against increased rates on shipments of coke to various Indiana points. The carriers of the State had filed rates on coke that the gas company believed too high, and it asked the Commission to suspend the rates, pending a hearing.

A RETURN of 7% on a valuation of $518,780 was allowed the Galesburg Railway, Lighting and Power Company by the gas arbitration board in the decision just announced. The rate is reduced from a flat $1 per 1,000 cubic feet to a scale starting with $1 for the first 1,000 feet and sliding to 80 cents per 1,000 after 7,000 feet have been consumed. With the exception of Chicago and the suburban territory surrounding it, this is the lowest rate in the State. The Board estimated the earnings of the company will be reduced $50,000 or $60,000.

THE output of the Boston Consolidated Gas Company for the month of November was 488,529,000 cubic feet, a decrease of 2% as compared with the corresponding month of last year. The output for the month of October showed a decrease of 4.4% and September a decrease of 5.2%.

THE extension of two franchises from the village of Lancaster, N. Y., to the Depew and Lancaster Light, Power and Conduit Company, one a gas franchise and the other an electrical franchise, to 1956 has been approved by the Public Service Commission. Originally the gas franchise was to have expired in 1946, and the electric franchise in 1931.

THE Worcester (Mass.) Gas Light Company has plans for a big garage to be erected on Quinsigamond avenue, opposite Crompton park, to house the 20 automobile trucks of the company. It will be one of the largest in Worcester. The plans provide for a building 102 by 65 feet. The construction will be of brick, concrete and steel, and it will be equipped with automatic sprinklers.

THE City Commission of Bismarck, N. D., has unanimously passed a twenty-five year gas franchise to Frank Ployhar, Valley City. Before them at the same time was a request from John Homan of Bismarck, who asked the privilege of presenting a gas franchise for the consideration of the commission.

THE Paulsboro (N. J.) Municipal plant is to be enlarged. Business is growing at so rapid a rate that additional manufacturing facilities are imperative.

NOTWITHSTANDING efforts made in St. Paul, Minn., to embarrass delivery of gas to the St. Paul Gas Company, the Western States Coke Company is exercising its options to purchase lands for the site of its proposed plant in Northeast Minneapolis. The books of the register of deeds of Hennepin county show a number of pieces of land which have passed into the hands of the company. The company has obtained from the Minneapolis City Council permission to run a pipe line from the site of its proposed plant to the St. Paul city line.

A FIVE years' contract to light the streets of Essex, Mass., with acetylene gas has expired, and the Essex Light and Power Company have closed their plant, owing to it being a considerable loss to them to operate it. As the town has provided no other means of lighting, the streets will be left in total darkness for the present.

THE Indiana Coke and Gas Company of Terre Haute, Ind., have placed a contract with the Gas Machinery Company for their by-product coke ovens and by-product recovery apparatus. The contract calls for 30 Gas Machinery Company Cross Regenerative By-Product Coke Ovens and Apparatus for Recovery of Tar and Ammonia. The plant is to be in operation August 15, 1916, and will handle Indiana coal. The coke, for the time being, will be sold for domestic purposes, and the surplus gas furnished to the Terre Haute Gas Company for local consumption.

FRANK J. JORDAN has been appointed local manager of the Brockton Gas Light Company in Stoughton, Mass.

WARM words of praise for the Doherty organization are contained in a volume entitled "Results," published in Toledo, O. It consists of the opinions of leading men and manufacturers in the various towns and cities in which the Doherty companies operate, on the service and courtesy furnished by the various companies. The communications cover a wide area of territory, and include men in all walks of life.

THE improvements under way at the plant of the Glens Falls (N. Y.) Gas and Electric Light Company include an additional holder of 200,000 cubic feet capacity, to be built by the Gas Machinery Company, a new coal handling system, and refilling two benches of six's with silica settings, by the Parker-Russell Mining and Manufacturing Company. Two miles of 6" main will be laid in South Glens Falls, on Main street and Saratoga avenue.

SEVERAL Des Moines, Ia., business firms are entitled to snug sums as a result of the gas company's rebate. The Register and Leader company outdistances every other, receiving a total of $517.09, the Des Moines Bridge and Iron Works will get $316.92, and Charles Yeretsky, owner of the Baltimore dairy lunches will receive $314.51. The city of Des Moines gets a refund of $306.71.

THAT the increase in natural gas rates in St. Joseph, Mo., to 60 cents per 1,000 feet, would be unfair to the consumers, is the sense of the State Public Service Commission, which holds that compared with other towns, the rate already is higher. The $1 rate for artificial gas is not disturbed. In his opinion, Judge Kennish says: "We are asked to sustain a rate of 60 cents per 1,000 cubic feet for natural gas as reasonable and just. The present rate, which has been in force since 1910, is 40 cents, and it is at least 10 cents per 1,000 cubic feet higher than is paid by the consumers of other municipalities, and 15% higher than is paid in many of them, including the city of Atchison, Kas., only about 20 miles from St. Joseph. The Kansas company now receives 26⅔ cents per 1,000 cubic feet as its share of the price paid by the consumer in St. Joseph, and the defendant company, 13⅓ cents: while in Atchinson the Kansas company receives less than 17 cents and the distributing company less than 9 cents.

THE October gas record of 39,000,000 cubic feet in Toledo, O., was 5,000,000 cubic feet more than September, and 10,000,000 over October of last year. The increase is due largely to the Overland Automobile plant.

UTILITIES COMMISSION NEWS.

MAY NOT CONTRACT IN PRIVATE CAPACITY.—The Marion Water and Power Company disputed the jurisdiction of the California Railroad Commission over the rate for water to the Sausalito municipal distributing system, which had been fixed by contract, contending that in entering into the contract it acted entirely in a private capacity, and not as a public utility; that the State had authorized the town to ignore the State's power to regulate the rate, and that by the town entering into such contract it nullified any jurisdiction the State had over such rate during the life of the contract.

The Commission, however, held that to contend that the sale of water to the municipality is of a private nature is clearly erroneous, for if such were the case, utilities could refuse to serve any one except under contract, thereby removing themselves from public regulation. That as regards this service and all other services the company is a public utility, subject to the jurisdiction of the Commission.

The Commission further ruled that it is now unanimously held that the provisions of the United States Constitution forbidding laws impairing the obligations of contract have no application to the regulation of utilities by States. All contracts, whether entered into prior or subsequent to the exercise by a State of its power to supervise rates, are subject to such control. The company's contention that this contract differs from other contracts of a like nature, because one of the parties thereto is a municipality and not a private individual or company, was held to be in error, for there is no difference between a municipal corporation acting in the capacity of a consumer, and a private corporation as a consumer.

COLLECTING A YEARLY MINIMUM.—A year's experience with the reduced electricity rates effected by an order of the Second District New York Commission has caused some confusion on the part of small customers of the Municipal Gas Company of Albany over the "minimum charge" of $9 a year. In cases where less than $9 worth of current has been used in the last year the company has met numerous objections when bills were presented in July for the balance represented by this difference. The Commission has accordingly made an order which it is hoped will do away with this confusion. In any month in which a customer's bill for current is less than 75 cents the company is permitted to send a bill for this monthly minimum under the rates provided. If at the end of the year the company has collected more than $9, and the customer has not used $9 worth of current, the company will refund the difference between the amount collected and the $9 minimum.

It has also been found that a good deal of trouble is caused by reason of the fact that the year on which this minimum is reckoned ends July 31, while the company's fiscal year ends December 31. The company is therefore authorized to make this year coincide with its fiscal year beginning on the first of the coming January. Minimum charges for the period between July and January this year will be pro-rated and considered as $3.75 for the five months.

SAME VALUE AS FOR TAXATION.—No distinction will be countenanced by the New Jersey Board of Public Utility Commissioners between the valuation of a property for taxation purposes and for the issuance of securities; the Commission says, in connection with the application of the Raritan River Railroad Company to issue capital stock. The company maintained that although it has succeeded in obtaining a reduction from the assessed valuation of $840,213 to $753,648, the former value should hold as the value of the property when making a valuation for the purpose of issuing stock. By the New Jersey Constitution all property is taxable at its full value, and the Commission stated that it could not assume, particularly in view of the petitioner's appeal from the assessment of the State Board of Assessors, that the value of the property was more than that finally held by the assessors.

CHAIRMAN MCCALL REMOVED.—Governor Whitman has removed from office, Edward E. McCall, Chairman of the Public Service Commission of the First District, New York. The charge of which the Governor found Mr. McCall guilty is that he violated Section 9 of the Public Service Commission Law, which forbids a Commissioner to hold stock in a corporation subject to the supervision of the commission. Colonel William Hayward was designated by the Governor to serve as acting Chairman until a Chairman is appointed.

Chairman McCall held 387 shares of the stock of the Kings County Electric Light and Power Company, and his defense was that he transferred this stock to his wife before he was appointed to the Commission. In his opinion, the Governor said there was no evidence before him of the transfer, except the Commissioner's unsupported statement, and that while he had no desire to question the truth of Mr. McCall's statement, "he did not believe that a transfer within the meaning of the law ever was made."

The Governor also pointed out that Commissioner McCall could have been imprisoned for six months for failing to affix transfer tax stamps to the certificates of stock, and that the fact he is protected by the statute of limitations has no bearing on the case. The Governor said he was entirely willing to accept the statement that Mr. McCall's carelessness, covering a period of 2 years, was alone responsible for the compromising situation in which he was placed. Mr. McCall, he added, should have conformed to the spirit of the law as well as to its technical requirements.

Financial Notes.

MOTION for confirmation of the sale of the DOVER, ROCKAWAY AND PORT ORAM GAS COMPANY'S plant at Dover, N. J., has been made before Vice-Chancellor Stevens on behalf of the Fidelity Trust Company, trustee under the second mortgage on the property. The mortgage was made to secure $90,000 bonds of the company, and when put up by the sheriff of Morris County, the plant was bought by representatives of Henry M. McFarland, of Hyde Park, Vt., and Alfred E. Watson, of White River Junction, Vt., holders of seventy-eight second mortgage and fifty-five third mortgage bonds and of 968 shares of the capital stock. Addison Ely, president of the company, appeared to object to the sale. He declared that the property is worth nearly $400,000, and that the two Vermont men were trying to get his property away from him. The auction he said was not advertised as it should be under the law and the contracts. The sum realized, $110,000, was not only inadequate, but if a proper advertisement was printed a great deal more than enough to pay all the debts could be realized. The company, Mr. Ely said, has been laboring under difficulties because the franchise limited the price to $1 per 1,000 cubic feet after 25,000,000 cubic feet had been sold. In the district where the company is operating this could not be done profitably, and Mr. Ely has negotiated for a change in the franchise which would give the company a profit. This had been promised, and if the change is made the company can be put on its feet.

THE PACIFIC GAS AND ELECTRIC COMPANY has succeeded in obtaining all the public utility enterprises of the Oro Electric Corporation for $1,372,500 or $750 each for the outstanding $1,830,000 first mortgage 6% bonds of the Oro Electric Corporation. The property comprises about 2,000 acres of dam and reservoir site at Belden, Plumas County, which could be developed to assure an output of 40,000 horse power of electrical energy, two small plants on the west branch of the Feather River of a combined capacity of 3,000 horse power and the distributing system in the neighborhood of Stockton. It is not probable the Belden site will be developed in the near future by the purchasing company. It will be held in reserve to provide for the future growth of the State.

OFFICIALS of the LACLEDE GAS LIGHT COMPANY expect that surplus available for common dividends for the calendar year 1915 will exceed $1,000,000, or 9.35% on the $10,700,000 common stock which received 7% in dividends. This would compare with $870,682 in 1914, $867,004 in 1913, $898,822 in 1912 and $853,040 in 1911. In the first quarter of the current calendar year surplus available for the common stock advanced $11,606, in the second quarter $33,377 and in the third quarter $51,681. To make a surplus of $1,000,000 for the year, the fourth quarter would have to gain about $40,000, which has been achieved in the first six weeks of the period. The balance for the year, of at least $250,000 after the payment of 7% on the common stock, will be added to the reserve fund for common stock dividends, increasing it to about $750,000 which ensures common stock holders dividends for a full year without earnings of any sort. In addition to the reserve fund for common dividends, the company's profit and loss surplus approximates $280,000, and its renewal and contingency reserves are equal to 7% on the $10,700,000 common stock. About four weeks ago, the company sold to bankers $750,000 debentures, making $3,250,000 outstanding and leaving $1,750,000 authorized but unissued. The proceeds were used to liquidate loans and accounts payable, which on September 30 amounted to about $1,075,000. Loans had grown on account of expenditures in the construction of the new by-product plant. With the money derived from the sale of the debentures the company's working capital now approximates $850,000.

THE MASSACHUSETTS GAS COMPANIES will benefit materially by the improvement in demand and higher prices for coal and coke. The earnings from coal can stand a substantial improvement, as the profits of this department have been comparatively small during September and October, as shown: September net earnings, 1915, $95,889; 1914, $99,343; decrease, $454. October net earnings, 1915, $85,667; 1914. $103,700; decrease, $18,033. The New England Coal and Coke Company is the largest distributor of bituminous coal in New England, with sales of approximately 3,500,000 tons annually. By operating its own colliers and barges and owning 600 freight cars on the Baltimore & Ohio Railroad, it has a decided advantage over its competitors, who are having difficulty in securing water freights even at the high record charter rates.

THE AMERICAN GAS AND ELECTRIC COMPANY has declared a regular quarterly dividend of 2½%, an increase of ½ of 1% over the previous rate, on its common stock, payable Jan. 3, to holders of record Dec. 18. The regular quarterly dividend of 1½% also has been declared on the preferred stock, payable Feb. 1, to holders of record Jan. 20. The company has authorized the sale of $1,079,440 new preferred stock at par, or $50 a share and accrued dividends. Holders of record of preferred stock, common stock, and common stock voting trust certificates of Dec. 8, may subscribe for one share of new preferred stock for each five shares now held.

THE ITHICA (N. Y.) GAS LIGHT COMPANY has filed notice of an increase in its capital stock from $200,000 to $1,000,000.

CONTENTS.

AN ASTERISK (*) DENOTES AN ILLUSTRATED ARTICLE.

PRESIDENT MCLEAN'S ADDRESS TO THE NATIONAL COMMERCIAL GAS ASSOCIATION..... 369

*NEWSPAPER ADVERTISING..... 370

*SOME DIFFICULT WORK IN LARGE GAS PIPE LAYING UNDER THE LACHINE CANAL AND ADJACENT SWAMPS, by C. H. Osler..... 371

INDUSTRIAL DEPENDENCE ON PETROLEUM, by John D. Northrop..... 373

A WARM RECEPTION..... 375

DISTILLED FEED WATER, by C. F. Hirshfield..... 375

EDITORIALS..... 376
English Coke Market Crisis—New York Section, Illuminating Engineering Society—Empire State Association Meeting.

OFFICIAL NOTICE—
Pacific Coast Gas Association..... 377

*ECHOES OF THE SHOW AND CONVENTION..... 379

NEW METHODS AND APPLIANCES..... 381
*Heat Economizing Furnaces.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 382
Chamberlain Wins Golf Cup—Western Gas Construction Company Builds in Canada—Mr. Bullock Popular—Safety Motion Pictures—Walden, N. Y., Franchise—Stacey Mfg. Company Busy—Needs the Pennies—New Officers, U. G. & E. Corporations—Rochester, Minn., Improvements—A Land Mark—Protests Freight on Coke—Galesburg Arbiters Decision—Boston Outputs—Extend Franchises—Worcesters Big Garage—Bismarck Franchise Granted—Paulsboro, N. J., Growth—St. Paul or Minneapolis?—Essex, Mass., Dark—Gas Machinery Company to Build Coke Plant—Stoughton, Manager—Praise Results—Glens Falls Improvements—Big Refunds—St. Joseph Rates—Toledo Send-Out.

UTILITIES COMMISSION NEWS..... 383
May Not Contract in Private Capacity—Collecting a Yearly Minimum—Same Value as for Taxation—Chairman McCall Removed.

Financial Notes..... 384

Public Lighting Table for Dec., 1915 (Ad. Section)..... 7

Meeting Times of the Various Gas Associations (Advertising Section)..... 21